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# SCIENTIFIC AMERICAN

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FELLING TREES WITH THE ELECTRIC SAW.—[See page 235]

Vol. CXXI. No. 10
September 6, 1919

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# The Way to Buy a Motor Truck

SO many different makes of trucks are being offered for sale for such a variety of reasons that the simple fundamentals of value in a truck are apt to be overlooked by the purchaser. Satisfactory answers to the following questions will go far to safeguard even the most inexperienced.

***How Long Has the Truck Been Built?*** Until a make of truck has been operating a number of years it has had no chance to prove its life. It is still experimental. There are White eight and nine year olds which have run 200,000 and 300,000 miles, and are still giving the best of service.

***What Is Its Record?*** What has a truck actually DONE, over a period of years, in the hands of thousands of owners? The steadiness with which it works, its ratio of days in active service, is an important factor in low cost of hauling. All records of which we have any knowledge show that White Trucks have the highest operating percentage, by a wide margin.

***Who Are Its Owners?*** If large fleet users, governed by comparative cost records, buy a certain make, year after year, in ever-increasing numbers, their choice is a pretty safe guide. The White Company publishes an annual ROLL CALL of fleet owners whose installations aggregate many thousands of White Trucks and continue to grow steadily from year to year.

***Who Is Its Maker?*** The maker of a truck is like the issuer of a bond—an indispensable factor in its value. His experience, plant, manufacturing policy, resources, facilities and service to owners, make a big difference to truck users, in the truck they get and the service it renders. His ability to stay in business and stand behind his product is a factor in its future value. The White Company has years of experience, thousands of trained employees, tens of thousands of trucks in active service.

***What Are His Service Facilities?*** Service is essential to truck operation. With innumerable trucks in active use, it may require as much capital, as extensive plant, as good manufacturing ability, to give *owner service* as to build the truck itself. Such resources require time, money and experience. The White Service Organization is nation-wide, representing a large capital outlay.

***What Is His Output?*** Output has considerable bearing upon the actual truck value represented in its cost. Without the advantages of increased output and more efficient methods of production, a manufacturer lacks the ability to absorb rising costs. He does not have the conditions for economical manufacture. The large output of White Trucks combined with increased efficiency in men, methods and machinery has kept the White price remarkably stable during a period when truck prices have advanced as much as sixty per cent.

The above factors are *important;* they determine the kind and cost of transportation service an owner gets—and that is after all the only thing worth buying. Because of these factors White Trucks have a high earning power and are in greater demand than trucks of any other make.

THE WHITE COMPANY
CLEVELAND

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And—it's wonderful how toasting improves Burley tobacco.

Isn't that all plain common sense? Of course. Get the Lucky Strike cigarette for flavor. It's toasted.

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—which means that if you don't like LUCKY STRIKE Cigarettes you can get your money back from the dealer.

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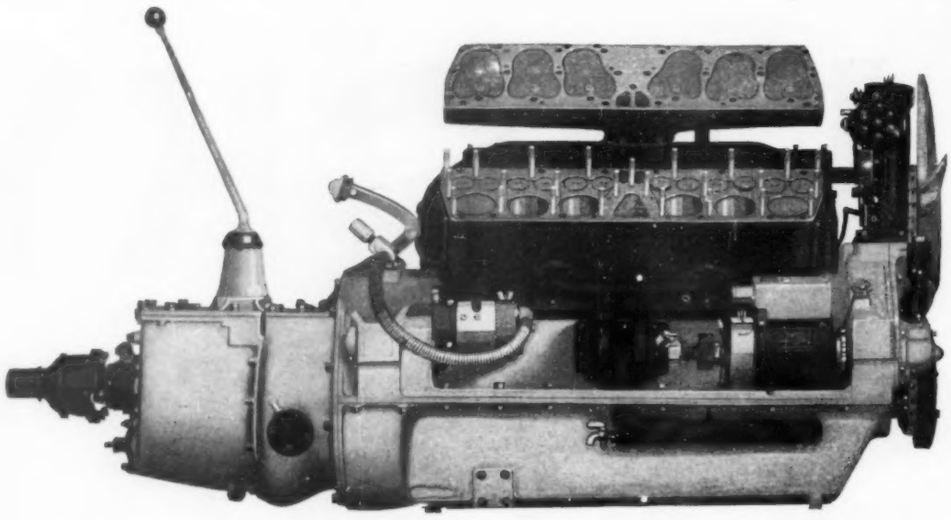


*Simplicity and Accessibility, attributes of Twin-Six Engineering*

# How Packard "Equation" Reduces Transportation Cost

THE average motor car buyer misses the true relationship between the first cost of a car and its final cost—its running charges, upkeep and repairs through the life of the car.

"Equation" is found when the cost of maintenance is low enough to offset a higher initial expenditure; when the used-value is sufficient to count materially towards the purchase of a new car; when the quality of the transportation is such that it delivers you at your destination fresh in nerves and body.

It does not take long for high upkeep and unreliability to outweigh low purchase price.

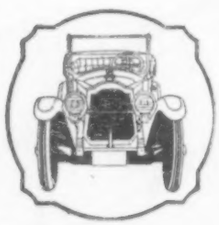
And this is the secret of that well known fact that a compromise car always proves more costly in the long run than the Packard.

Because of the perfect balance of the Packard Twin Six, it is less expensive to maintain than automobiles costing two - thirds or one-half as much.

Its ease of motion, its freedom from vibration, its tremendous reserve of power, combine to give it the longest life of any car in America.

In fact, motor car investment is like any other investment—in the end the seasoned security pays better than the speculative stock.

The Packard people are transportation experts. They have more to tell you on this subject than any other organization in the world. You can ask them to discuss your car problem without obligation. It is to your interest and profit to do so.



*"Ask the Man Who Owns One"*

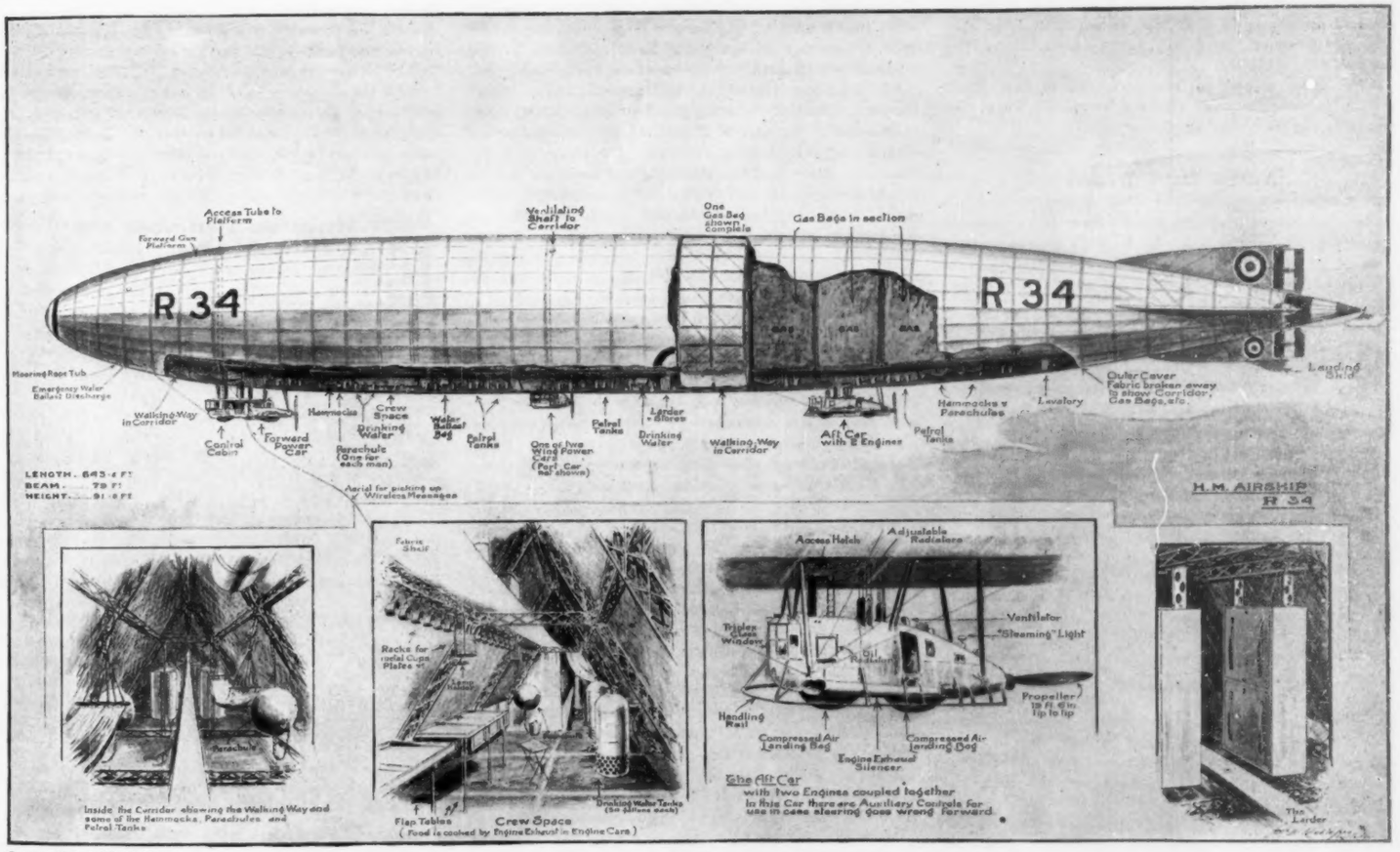
PACKARD MOTOR CAR COMPANY, *Detroit*

SEVENTY-FIFTH YEAR

# SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXXI. NUMBER 10 ] NEW YORK, SEPTEMBER 6, 1919 [10 CENTS A COPY $5.00 A YEAR




Courtesy, Illustrated London News

**Details of the trans-Atlantic British dirigible R-34 as sketched by an English artist**

## Envelope Problems of the Dirigible Constructor

AFTER all, the envelope is perhaps the main member of a rigid airship. It is the one member that calls for the greatest skill and experience, and upon which the success of the airship depends in very large measure. In turn, the efficiency of the envelope hinges largely on the merits of the doping to which the envelope is treated.

Few persons realize the important rôle played by the doping of the envelope of a dirigible, except those who have to do with the construction and maintenance of huge airships such as the R-34. To the layman it seems almost unbelievable that years should be spent in developing suitable dopes for airplanes and dirigibles, yet such is the fact. Great Britain, in the course of the war, called upon some of her leading chemists to work on the dope problem. This had the effect of materially assisting the technical control of all doping operations carried out at the aircraft factories, and the inspection of same as well.

In order to give some idea of the complex nature of the dope for dirigible envelopes, it may be mentioned that the total proofing weight is limited to two grams per square meter, and that this protective covering must withstand long exposure to the weather on the entire surface of the outer cover of vessels of such large superficial areas as the R-33 and R-34. It is necessary to bear in mind, too, that the properties required for a doping combination for use on a rigid airship are utterly different from those generally understood in relation to the dope and dope coverings for the fabric surfaces of airplanes. Also the outer cover surfaces, while in position on the airship, are required to remain in as uniform a tension as possible, yet the proofing has to be extremely pliable in order to withstand the handling which the outer cover has to suffer in its preparation and fixing in position.

Nevertheless, this pliable proofing must be weatherproof and particularly non-moisture absorbent. The tremendous surface exposed to the saturated atmosphere while in flight would, with an unsatisfactory proofing, entail the absorption of a great deal of moisture which by virtue of its weight would materially interfere with the speed of flying and lift of the ship.

The first improved airship doping scheme was adopted by the British Admiralty in November, 1916, but since then the subject has continued to receive extensive study, with the result that from time to time material improvements have been effected.

The scheme used on the huge R-33 and R-34 dirigibles is known as Airship Doping Scheme P, which is said to be greatly superior to the best of the proofings employed on German airships, in its general properties. The fact that the R-34 was able to cross the Atlantic successfully in both directions under adverse atmospheric conditions very expressively indicates the extent to which the doping combination carried under Scheme P is resistant to atmospheric moisture. Even this scheme, however, is said to have been considerably improved upon during the last few months, with the result that the new British dirigibles will be still better protected from the elements.

## Shasta Strawberry Vines

ONE of the most unusual agricultural industries in the United States is strawberry vine production in the California mountain district of Shasta. Around Castella, a production center, the vines are grown by the hundreds of thousands, and shipped to Watsonville and other strawberry market districts. Castella growers make much more out of vines than they do out of berries, owing to the peculiarly favorable climatic and soil conditions. The shipping season ends in early March. Last season one grower shipped 203,000 vines. His price was $8 a thousand.

Strawberries are propagated from shoots, called "runners," which the parent plant sends out and which themselves take root. It is only thus that a variety is preserved, as plants grown from seeds, just as with apples and other tree fruits, do not reproduce faithfully the prized variety type.

One of the early settlers in the Mt. Shasta district observed that the native strawberry was remarkable for size and flavor, outranking anything he had ever seen before.

# SCIENTIFIC AMERICAN

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*The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.*

*The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.*

## A Nine Days' Wonder?

For many decades the great white plague that has passed under so many names before acquiring its present title of tuberculosis was considered to be absolutely beyond cure. People who were known to have it were condemned to a living death, avoided by their fellows only in less degree than if they had been suffering from smallpox or leprosy. People who thought they had it postponed to the uttermost the day when they must go to the physician for the dreaded verdict; and the verdict rendered, they concealed it from friends and family when and while they could.

Fifteen years ago a group of medical men got together for the purpose of spreading the message that this disease was, after all, curable when taken in time. Not only this bald statement overthrew accepted beliefs, but the method of cure was stated to lie in the most extraordinary reversal of the long-established procedures by which a person with the slightest ailment

inefficiency when employed in legitimate operations against enemy warships.

Our suggestion that, because of the German misuse of it, the submarine should be outlawed has brought forth so many protests from naval officers, and, strange to say, particularly from those of the British service, that we have made a fresh study of the subject, based upon hitherto unrevealed facts of the war, and as a result we confess to a considerable modification of our attitude, particularly as to the military efficiency of the submarine.

Thus, an officer of our own service who has specialized in submarine work writes us: "I think you do a great injustice to the British submarine service, for they have done truly remarkable work. It may interest you to know that the losses in the British submarine service were relatively greater than the losses in any other branch of any service engaged in the World War. Some day the truth will be told and the British submarine will gain the crown it so justly deserves."

The efficiency (legitimate military efficiency) of the German submarines during the four years of war has been revealed by one of the Allied Service magazines, which states that they accounted for more warships than any other agency. Omitting the warships lost by being wrecked, by collisions and by accidental explosions, submarines accounted for nearly one-third of the total losses, the mine coming next with one-fifth to its credit. Since the mines, after the first few months of the war, must have been laid by mine-laying submarines, the Allies having command of the surface of the sea, it is reasonable to credit the submarine with one-half of the Allied loss in warships.

So much for its tactical success. As to its strategical effects, they are so well known as to require no elaboration. One does not read very far in Jellicoe's book without realizing how greatly the submarine influenced, if indeed it did not dominate, the strategy of the North Sea and the great blockade. In the early days of the war the British seem to have attempted a close blockade of the enemy coasts; but the sinking of the "Cressy," "Aboukir" and "Hogue" by a single submarine in a single attack changed the strategy overnight, and thenceforth the close blockade was abandoned. Later, it is true, the British submarine took over the work

can cut loose from its base and cruise for months upon the high seas in absolute independence. Hence it is the ideal vessel for observation and blockade. In speed it has gone up to 24 knots (as in the case of the British K boats) and in size to 2,500 tons. In the present state of the art it is possible, on a displacement of 1,800 tons, to build a submarine of 18 to 20 knots maximum surface speed, that can stay at sea continuously for three months and cover 10,000 miles at cruising speed. The maximum speed submerged would be 12 to 13 knots for 1 to 1½ hours, and at 5 knots submerged the radius would be about 220 miles.

These then are the proved military capabilities of the submarine, as determined or suggested by the experiences of the late war, and in all fairness it must be admitted that as a military unit, it has come into its own. Had it not been for the German abuse of the weapon, its abolition would never have been suggested; but, as one party to the present controversy remarked: "What legitimate weapon of war did they not abuse?"

That the cause for abolishing the submarine on humanitarian grounds is strong cannot be gainsaid; but that the interdict could be carried out is doubtful, because of the vast system of oversight that would be required—to say nothing of the irritation resulting from the wholesale espionage that would be necessary.

## Motion and the Graphic Arts

EDITORIALS are not always born within the sanctum, for on this particular occasion the Editor was sitting at the water's edge beneath a tree on a fine summer morning. The sunlight reflected from the ripples on the lake threw a tremulous pattern upon the under surface of the leaves of the overhanging tree, making them alive with a perpetual motion.

The effect is difficult enough to describe in words; to render it with canvas and brush would be utterly impossible. And that started the Editor thinking.

Every art has its special field, and also its peculiar limitations. The art of painting is not exempt. Music, poetry and literature unfold their theme as a progression in time. Painting must be content to fix selected scenes. It may indicate motion, but it cannot actually show it in progress. Then again, the painter's brush


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starving by the thousands on the drouth stricken range of Texas, New Mexico and Arizona, the cattlemen looked helplessly upon vast quantities of green vegetation—sotol, bear grass and Spanish bayonet—desert plants that in their rough state were unfit for stock feed. It remained for an ingenious machinist to invent and construct a shredding machine that reduced the tough desert growth to sustaining feed for the perishing cattle. From the ranchmen who were interviewed it has been estimated that more than 16,000 head of cattle were fed on these shrubs, and that probably 90 per cent of this number would have died had not the inventive genius of man come to the rescue and converted this otherwise useless material into an emergency feed.

## Electric Properties of Silicon and Germanium

SILICON exhibits the highest known thermo-electric power. It is a curious fact that silicon is either strongly electropositive with respect to copper or electronegative, according to the method of preparation, and by combining the positive and negative varieties thus obtained, we can construct a thermo-electric couple displaying the enormous differences of potential of 1,000 microvolts per degree centigrade. The small quantities of impurities, such as iron, which are always found in silicon, diminish the thermo-electric power without, however, changing its sign. By crystallizing the silicon in aluminum to purify it, we obtain a strongly positive product; by crystallizing it in silver or in tin, in each of which it is less soluble, we arrive eventually at an electronegative product.

Experiments with Germanium demonstrate that this body presents the highest thermo-electric power next to silicon. These two substances also resemble each other in other respects, in particular, in their remarkable power of rectification with respect to the Hertzian oscillations.

The character of the marking which constitutes the present invention may be described in general terms as an inverted bramble pattern, and consists of isolated cavities the essential features of which are that they must be substantially circular in plan and substantially evenly distributed. They must be shallow, and their sides, particularly at the lip of the cavity, must be steep. Steepness of the cavity walls is essential to the hanging flight, but excessive depth besides promoting the collection of dirt, is detrimental to length of flight by offering great resistance to the passage of the air. Consequently the cavity must be shallow and the steepness of its walls confined to the immediate neighborhood of the lip."

The defendants made balls pitted with spherical cavities similar in proportion and size to the plaintiff's. The issue in the case was whether these conformed to the words "with steep sides at the peripheries only of said cavities," which are contained in all the claims in suit. The section of the defendant's pits was the arc of a circle, and the angle subtended varied between 28 degrees for the defendant Wanamaker's ball, and 35 degrees for the defendant Buckley's. The tangents to the curve of the pit at the lip were therefore, in the first case, of 152 degrees, and, in the second, 145 degrees. The District Court found that pits of this character did not answer the element of the claims above mentioned and dismissed the bills for non-infringement.

Held, that where a claim broad enough to include defendant's article was several times rejected by the Patent Office, the patentee is thereby precluded from asserting that the claims allowed should be given the same meaning as the rejected claim. The court examines the file wrapper of a patent only to determine the question of estoppel through rejected claims, and cannot consider the arguments of the applicant and the examiner.—*A. G. Spalding & Bros. v. John Wanamaker, N. Y. Circuit Court of Appeals, N. Y.*

## Automobile

**Oil Shale Deposits.**—The possibility of using the oil shale deposits of the United States as a source of liquid fuels is under consideration. These are found in several portions of the country but those in Utah and Colorado are the most extensive. At first glance this material shows no signs of oil but when it is heated, the organic materials in its composition are broken up and among other things, oil and gas are obtained. The yield varies from 6 to 90 gallons of crude oil per ton of shale, which will yield 7 to 12 per cent gasoline, 28 to 44 per cent kerosene and other valuable products. Considerable use is made of shale oil in England and Scotland.

**Recording Instrument for Cars.**—A Detroit inventor has patented an instrument to be installed in a motor vehicle that provides a continuous record of every period of use of a car. In brief, it consists of a strip of ruled record paper moved by clockwork. A suitable marking device is attached to the speedometer of the combination. The mark left on the record sheet shows the speed at which the car was traveling at any indicated time, as the paper strip is divided into days, hours, and minutes. This device is believed to be of value to operators of taxicabs where meters are not required by local ordinances and also to owners of expensive automobiles driven by chauffeurs, not to mention its possibilities in the motor truck field.

**Steel Disk Wheels Popular.**—There is a growing tendency on the part of motorists to favor the pressed steel disk wheel and increasing numbers of fine cars are being equipped with traction and support members of this type. The wheel used for passenger cars is a single disk type, being dished for strength. In most designs the thickness of the metal is greater at the center than at the rim, thus proportioning the section to the strain coming upon it. A cast-steel master hub is fastened to the axle, and the steel disk is attached to this by four easily removable nuts which screw on studs in the permanent hub flange. The disk wheel is as easily removed as any other type and is stronger and more easily washed than the conventional wood or wire spoked forms.

**Farmers Will Purchase Many Cars.**—It is estimated that the farmers of America will absorb 2,000,000 motor trucks in the next 10 years, not to mention the large number of passenger cars they will purchase. And

## Science

**Ground Ice in Alaska.**—A professional paper of the U. S. Geological Survey on the Canning River region, in northern Alaska, by E. de K. Leffingwell, describes the occurrence of ground ice in that region and reviews the literature of ground ice in considerable detail. The author concludes that the two varieties of ground ice most common in northern Alaska are formed by the burial of river ice by sediments and by the growth in place of vertical ice wedges.

**Reopening of Ben Nevis Observatory.**—Meteorologists throughout the world will learn with much satisfaction that the famous observatory on Ben Nevis, Scotland, which was closed in 1904, is to be taken over by the British Air Ministry and operated in connection with the system of weather forecasting for aeronauts. Its altitude, 4,405 feet, greatly exceeds that of any other observatory in the British Isles. The Ben Nevis Observatory was maintained for twenty years by the Scottish Meteorological Society, with the aid of a small government grant, and was closed when the grant was withdrawn.

**Alcoholizing Injured Nerves.**—An article in the *New York Medical Journal* discusses the numerous cases recorded during the war of intense and persistent pain arising from injured nerves and the wide range of remedies tried in such cases, generally with little success. Certain nerve trunks are found to react more readily to painful sensations than others; among these are the median and sciatic, and more rarely the ulnar and crural. Major Sicard, of the French Army, after trying all the ordinary methods of treatment, obtained remarkable results from intraneural injections of alcohol. Under a general or sometimes a local anesthetic, the nerve is freed from adjacent tissue and from one to two cubic centimeters of alcohol is injected. Of forty-three cases treated, only one was unsuccessful.

**Proposed U. S. Department of Health.**—Following the example of Great Britain, which has recently established a Ministry of Health, a bill creating a Department of Public Health was introduced in the U. S. Senate July 17. The secretary at the head of the department is to be a cabinet officer, while of the three assistant secretaries the first is to be a man trained in medical science, the second an expert in vital statistics, and the third a woman trained in medicine or nursing

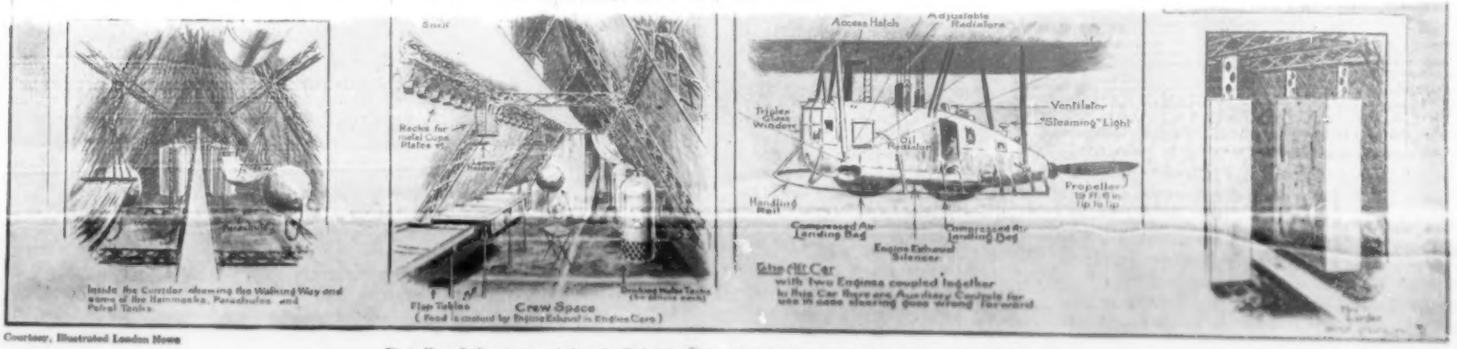
## Electricity

**A Real Electric Brush.**—Among the recent electrotherapeutical devices introduced to the public is an electric brush which, instead of being supplied current from a battery in the usual fashion, contains its own source of power. Leaving aside the therapeutical qualities of the electric brush, the present device is of immediate interest because of its electrical features. It contains a small generator which is capable of delivering currents of infinitesimal amperage but at potentials of from 50 to 200 volts. The generator is driven by pressing a lever beside the handle, which lever operates through a chain of gears.

**Eddy Current Braking Devices.**—Some experiments were recently conducted at the University of Breslau by G. Hilpert and M. Schliecher on eddy-current brakes, consisting of iron rings facing, at each extremity of a diameter, a pair of magnetic poles. Such brakes were tested up to 30 horse-power with a circumferential velocity of 17 meters per second. The effect of various excitations of the magnets and speeds on braking power were illustrated by diagrams, and compared with theoretically determined results. It appears that such brakes can dissipate about the same power within a given mass of material as friction brakes. The cost is somewhat higher, continues *The Electrician*, but there are advantages, such as smoothness of running and convenience of control.

**Animal Electrocution.**—Recently, at a Los Angeles motion-picture colony, there took place an interesting electrocution, the victim in this case being a big leopard which had been employed filming so-called "animal stuff." Because of the treacherous attitude of this leopard, it was decided to execute him before injury befell any of the players. At first shooting was decided upon, but in view of the extreme beauty of the animal's pelt, electrocution was finally adopted. A large steel plate was placed on the floor of the cage, and a wire fastened to the animal's leg. When the leopard was finally coaxed over to the steel plate, the 6,000-volt current was switched on for an instant, resulting in the immediate death of the erstwhile motion-picture performer.

**Amateurs and Vacuum Tubes.**—For a while after the raising of the ban on amateur radio reception, it




Courtesy, Illustrated London News

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## Shasta Strawberry Vines

ONE of the most unusual agricultural industries in the United States is strawberry vine production in the California mountain district of Shasta. Around Castella, a production center, the vines are grown by the hundreds of thousands, and shipped to Watsonville and other strawberry market districts. Castella growers make much more out of vines than they do out of berries, owing to the peculiarly favorable climatic and soil conditions. The shipping season ends in early March. Last season one grower shipped 203,000 vines. His price was $8 a thousand.

Strawberries are propagated from shoots, called "runners," which the parent plant sends out and which themselves take root. It is only thus that a variety is preserved, as plants grown from seeds, just as with apples and other tree fruits, do not reproduce faithfully the prized variety type.

One of the early settlers in the Mt. Shasta district observed that the native strawberry was remarkable for size and flavor, outranking anything he had ever seen before.

# SCIENTIFIC AMERICAN

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*The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.*

*The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.*

## A Nine Days' Wonder?

FOR many decades the great white plague that has passed under so many names before acquiring its present title of tuberculosis was considered to be absolutely beyond cure. People who were known to have it were condemned to a living death, avoided by their fellows only in less degree than if they had been suffering from smallpox or leprosy. People who thought they had it postponed to the uttermost the day when they must go to the physician for the dreaded verdict; and the verdict rendered, they concealed it from friends and family when and while they could.

Fifteen years ago a group of medical men got together for the purpose of spreading the message that this disease was, after all, curable when taken in time. Not only this bald statement overthrew accepted beliefs, but the method of cure was stated to lie in the most extraordinary reversal of the long-established procedures by which a person with the slightest ailment was at once hermetically sealed in a hot room that stank of perdition, and insulated from all contact with sunlight and fresh air. The utterly sensational character of all this forced the world to sit up and take notice.

One of the doctors concerned remarked the other day that when he discharged his first cured tuberculosis patient, and the man went home to build him a sleeping porch on his house, he furnished copy for all the Sunday supplements in the State for the next six months. The launching of the anti-tuberculosis work, both in its aims and in its methods, was so revolutionary that publicity was not one of the problems which had to be met.

Today the case is different. We have accepted the curability of consumption. We have accepted its preventability. We have accepted as part of our daily lives the methods of cure and prevention. But just as a prophet is without honor in his own country, so there are no things we so persistently disregard as those which we know best. The cure and prevention of tuberculosis have thus become commonplaces, about which we can only with the greatest difficulty be induced to think, and then only casually.

The consequence is that the men behind the work of curing, preventing and eliminating tuberculosis in this country find increasing trouble in securing funds and in enlisting the coöperation of officials and citizens which is so necessary for the adequate prosecution of their work. It is hardly an exaggeration to say that the American reluctance to respond to anything except the most violent novelties is putting in grave peril the whole work of tuberculosis control. Must the sanitary engineer win public support by parading a new sensation or a new slogan every week?

## The Argument for the Submarine

IN our previous issue we presented the argument against the future construction of submarines, which is based mainly upon its frightful potentiality as a means of piracy against merchant shipping, and to a less extent upon its hitherto supposed tactical inefficiency when employed in legitimate operations against enemy warships.

Our suggestion that, because of the German misuse of it, the submarine should be outlawed has brought forth so many protests from naval officers, and, strange to say, particularly from those of the British service, that we have made a fresh study of the subject, based upon hitherto unrevealed facts of the war, and as a result we confess to a considerable modification of our attitude, particularly as to the military efficiency of the submarine.

Thus, an officer of our own service who has specialized in submarine work writes us: "I think you do a great injustice to the British submarine service, for they have done truly remarkable work. It may interest you to know that the losses in the British submarine service were relatively greater than the losses in any other branch of any service engaged in the World War. Some day the truth will be told and the British submarine will gain the crown it so justly deserves."

The efficiency (legitimate military efficiency) of the German submarines during the four years of war has been revealed by one of the Allied Service magazines, which states that they accounted for more warships than any other agency. Omitting the warships lost by being wrecked, by collisions and by accidental explosions, submarines accounted for nearly one-third of the total losses, the mine coming next with one-fifth to its credit. Since the mines, after the first few months of the war, must have been laid by mine-laying submarines, the Allies having command of the surface of the sea, it is reasonable to credit the submarine with one-half of the Allied loss in warships.

So much for its tactical success. As to its strategical effects, they are so well known as to require no elaboration. One does not read very far in Jellicoe's book without realizing how greatly the submarine influenced, if indeed it did not dominate, the strategy of the North Sea and the great blockade. In the early days of the war the British seem to have attempted a close blockade of the enemy coasts; but the sinking of the "Cressy," "Aboukir" and "Hogue" by a single submarine in a single attack changed the strategy overnight, and thenceforth the close blockade was abandoned. Later, it is true, the British submarine took over the work in a modified degree; but the attempt to shut the German fleets in their harbors by maintaining a superior force of surface ships off the German coasts was abandoned. Thereafter the lines of the British blockade were removed to the northern and southern exits from the North Sea, and the blockade lines were drawn from the Orkney Islands to Norway and from Dover to Calais. It is evident, then, that the work of the submarine service as now being revealed, has raised this type of fighting ship until it takes rank as one of the main elements in the make-up of a well-found fleet.

Naturally the abolition of the submarine would be to the great advantage of the power or powers which control the surface of the sea, or possess the largest merchant marine. Great Britain and the United States are the leading powers, both in the strength of their navies and size of their merchant fleets; so that it is very significant that the strongest arguments for retaining the submarine have come from these sources. These arguments are based, of course, upon its military value.

An admiral of our navy who spent the period of the war in Europe and was intimately associated with the naval operations, draws our attention to the demonstrated efficiency of the submarine as a scout, particularly as developed during the operations of the war. This type of vessel, he affirms, is the only one with which it is possible to establish a scouting line which cannot be chased away by more powerful vessels. "You hardly realize how much this means until you have been engaged in a good many chart maneuvers, or aerial maneuvers on the sea, and seen your scouting line of relatively light cruisers ripped up and rendered ineffective by the battle-cruisers of the enemy." But no line of battle-cruisers, however strong, would serve to scatter or break through a screen of submarines; and if they should attempt to drive through, seeking information of the enemy forces, they would do so at the greatest peril of loss or serious disablement.

Talk to any officer of this special service and he will tell you that the submarine is the one vessel that can cut loose from its base and cruise for months upon the high seas in absolute independence. Hence it is the ideal vessel for observation and blockade. In speed it has gone up to 24 knots (as in the case of the British K boats) and in size to 2,500 tons. In the present state of the art it is possible, on a displacement of 1,800 tons, to build a submarine of 18 to 20 knots maximum surface speed, that can stay at sea continuously for three months and cover 10,000 miles at cruising speed. The maximum speed submerged would be 12 to 13 knots for 1 to 1½ hours, and at 5 knots submerged the radius would be about 220 miles.

These then are the proved military capabilities of the submarine, as determined or suggested by the experiences of the late war, and in all fairness it must be admitted that as a military unit, it has come into its own. Had it not been for the German abuse of the weapon, its abolition would never have been suggested; but, as one party to the present controversy remarked: "What legitimate weapon of war did they not abuse?"

That the cause for abolishing the submarine on humanitarian grounds is strong cannot be gainsaid; but that the interdict could be carried out is doubtful, because of the vast system of oversight that would be required—to say nothing of the irritation resulting from the wholesale espionage that would be necessary.

## Motion and the Graphic Arts

EDITORIALS are not always born within the sanctum, for on this particular occasion the Editor was sitting at the water's edge beneath a tree on a fine summer morning. The sunlight reflected from the ripples on the lake threw a tremulous pattern upon the under surface of the leaves of the overhanging tree, making them alive with a perpetual motion.

The effect is difficult enough to describe in words; to render it with canvas and brush would be utterly impossible. And that started the Editor thinking.

Every art has its special field, and also its peculiar limitations. The art of painting is not exempt. Music, poetry and literature unfold their theme as a progression in time. Painting must be content to fix selected scenes. It may indicate motion, but it cannot actually show it in progress. Then again, the painter's brush can picture an episode in the drama of life, but its power of rendering the mental state, the living experience of the *dramatis personæ*, is limited far below the possibilities of the literateur or the playwright. Of the power to draw tears but a small share belongs to the painter's art. Where, in painting, is there an equal of the intense tragedy, the irresistible sway of Ibsen's plays, for example?

Modern science has given into our hands the means to project upon the screen actual motion, actual development of theme. Technically, at least, the old limitations of the graphic arts seem to be lifted. But, of course, the process employed is at present largely mechanical—though it gives the artist at least as much scope of scenic effect as does the legitimate stage, and rather greater scope of development of theme.

Surely, there is opportunity here for the true artist. Let not conservative prejudice bar the way to new departures. It is not the means employed to produce effect that make art, but the substance presented and the mode of presentation.

The moving picture drama of today, even in its better forms, is no doubt rather crude. But reflect how many thousands of years separate the paintings of the cave dwellers of Altamira from the works of the great masters of today and yesterday. Judged on this scale of comparison, the progress of the moving picture art, and we may dignify it with that name, is not without promise.

It is, therefore, not without interest that we note the endowment, by Mr. George Eastman, of a school of music in connection with Rochester University, the plan being that this school should aid in the development of the highest type of motion pictures as an ally of the highest type of music.

## To Our Subscribers

OUR subscribers are requested to note the expiration date on copies of SCIENTIFIC AMERICAN. If they will send in their renewal orders at least two weeks prior to the date of expiration, it will aid us greatly in rendering them efficient service.

## Automobile

**Oil Shale Deposits.**—The possibility of using the oil shale deposits of the United States as a source of liquid fuels is under consideration. These are found in several portions of the country but those in Utah and Colorado are the most extensive. At first glance this material shows no signs of oil but when it is heated, the organic materials in its composition are broken up and among other things, oil and gas are obtained. The yield varies from 6 to 90 gallons of crude oil per ton of shale, which will yield 7 to 12 per cent gasoline, 28 to 44 per cent kerosene and other valuable products. Considerable use is made of shale oil in England and Scotland.

**Recording Instrument for Cars.**—A Detroit inventor has patented an instrument to be installed in a motor vehicle that provides a continuous record of every period of use of a car. In brief, it consists of a strip of ruled record paper moved by clockwork. A suitable marking device is attached to the speedometer of the combination. The mark left on the record sheet shows the speed at which the car was traveling at any indicated time, as the paper strip is divided into days, hours, and minutes. This device is believed to be of value to operators of taxicabs where meters are not required by local ordinances and also to owners of expensive automobiles driven by chauffeurs, not to mention its possibilities in the motor truck field.

**Steel Disk Wheels Popular.**—There is a growing tendency on the part of motorists to favor the pressed steel disk wheel and increasing numbers of fine cars are being equipped with traction and support members of this type. The wheel used for passenger cars is a single disk type, being dished for strength. In most designs the thickness of the metal is greater at the center than at the rim, thus proportioning the section to the strain coming upon it. A cast-steel master hub is fastened to the axle, and the steel disk is attached to this by four easily removable nuts which screw on studs in the permanent hub flange. The disk wheel is as easily removed as any other type and is stronger and more easily washed than the conventional wood or wire spoked forms.

**Farmers Will Purchase Many Cars.**—It is estimated that the farmers of America will absorb 2,000,000 motor trucks in the next 10 years, not to mention the large number of passenger cars they will purchase. And there is every reason to believe this statement is correct, for the next few years will see a big development in the highways of the country. The truck will be more responsible for good highways than even the passenger car has been. The farmer has now been fully educated to the value of the passenger car. Statistics show that 73½ per cent of the passenger cars on the farm were bought as a necessary part of the farm equipment; 24 per cent bought their cars for both business and pleasure, while the ratio for pleasure only among the farmers is 2⅔ per cent. There is probably more wealth on the farm than ever before. It is claimed that there has been an increase of only 30 per cent in the prices paid by farmers for articles in common use on the farm, while the farmer has received 60⅞ per cent increase in prices for farm products.

**Automatic Oil Control System.**—A difficult problem has been that of controlling the oil supply in an automobile motor in order to have sufficient oil under the worst or most severe conditions, and still not too much oil when using but little power, or that which would be needed under average running conditions of a car on good roads and with a light load. Continual study has enabled the engineers of a prominent motor car maker to perfect a new automatic oil control on which they have applied for patents and which is said to accomplish the following results: A—When the motor is pulling its maximum load, or using its full horse-power, with the throttle wide open, the automatic oil control provides the maximum oil pressure needed, as well as the necessary oil supply to maintain the proper oil film under this full load condition. B—When the motor load is reduced and the throttle closed the control automatically reduces the oil pressure as well as the oil supply. C—It prevents the piling up of oil at either end of the oil basin, *i. e.*, when going up a grade or when going down a grade. D—It distributes the correct amount of oil in the oil pockets for each cylinder, regardless of the grade, load condition or speed. It is said no cylinder is ever starved of oil or gets too much.

## Science

**Ground Ice in Alaska.**—A professional paper of the U. S. Geological Survey on the Canning River region, in northern Alaska, by E. de K. Leffingwell, describes the occurrence of ground ice in that region and reviews the literature of ground ice in considerable detail. The author concludes that the two varieties of ground ice most common in northern Alaska are formed by the burial of river ice by sediments and by the growth in place of vertical ice wedges.

**Reopening of Ben Nevis Observatory.**—Meteorologists throughout the world will learn with much satisfaction that the famous observatory on Ben Nevis, Scotland, which was closed in 1904, is to be taken over by the British Air Ministry and operated in connection with the system of weather forecasting for aeronauts. Its altitude, 4,405 feet, greatly exceeds that of any other observatory in the British Isles. The Ben Nevis Observatory was maintained for twenty years by the Scottish Meteorological Society, with the aid of a small government grant, and was closed when the grant was withdrawn.

**Alcoholizing Injured Nerves.**—An article in the *New York Medical Journal* discusses the numerous cases recorded during the war of intense and persistent pain arising from injured nerves and the wide range of remedies tried in such cases, generally with little success. Certain nerve trunks are found to react more readily to painful sensations than others; among these are the median and sciatic, and more rarely the ulnar and crural. Major Sicard, of the French Army, after trying all the ordinary methods of treatment, obtained remarkable results from intraneural injections of alcohol. Under a general or sometimes a local anesthetic, the nerve is freed from adjacent tissue and from one to two cubic centimeters of alcohol is injected. Of forty-three cases treated, only one was unsuccessful.

**Proposed U. S. Department of Health.**—Following the example of Great Britain, which has recently established a Ministry of Health, a bill creating a Department of Public Health was introduced in the U. S. Senate July 17. The secretary at the head of the department is to be a cabinet officer, while of the three assistant secretaries the first is to be a man trained in medical science, the second an expert in vital statistics, and the third a woman trained in medicine or nursing and public health. It is proposed to transfer to the new department the U. S. Public Health Service and the Bureau of Chemistry, and there would also be bureaus on vital statistics, sanitation, hospitals, child and school hygiene, quarantine, food and drugs, nursing, tuberculosis and personnel. The department is to establish a far-reaching scheme of coöperation in public health work and the gathering of vital statistics between the federal and state governments, with grants of money from Congress on the half-and-half-plan which has recently been adopted in so many other coöperative official undertakings.

**Temperature Measurements in Deep Wells.**—Mr. C. E. Van Orstrand, in a paper presented before the Geological Society of Washington, has given an interesting summary of the results of temperature measurements in a number of deep wells located in Texas, Oklahoma, Pennsylvania and West Virginia. The apparatus which he devised for making these measurements is accurate within 0.2 or 0.3 deg. Fahr. for depths of about 4,000 feet, while for greater depths the error may rise to 0.5 deg. in some cases. The depth temperature curves are not straight lines, but curves with a marked convexity towards the axis of depth. Thus in the case of the remarkably deep Goff well, in West Virginia, which was drilled to 7,386 feet, the rate of temperature increase varies continuously from 1 deg. Fahr. in 97.5 feet at the surface to 1 deg. Fahr. in 46.5 feet over the interval 6,000 to 7,000 feet. In the Texas and Oklahoma oil fields temperatures at a given depth differ widely from those found in Pennsylvania and West Virginia. The temperature of the oil in two wells near Mannington, W. Va., is 83.2 deg. Fahr. at a depth of about 2,900 feet. In the Ranger field, Texas, the temperature of the oil at 3,400 feet is estimated, from measurements at higher levels, to be about 135 deg. The average rate of temperature increase at the surface for thirteen wells in Texas and Oklahoma is about 1 deg. Fahr. in 51.5 feet, as compared with 1 deg. in 91.5 feet for twelve wells in Pennsylvania and West Virginia.

## Electricity

**A Real Electric Brush.**—Among the recent electrotherapeutical devices introduced to the public is an electric brush which, instead of being supplied current from a battery in the usual fashion, contains its own source of power. Leaving aside the therapeutical qualities of the electric brush, the present device is of immediate interest because of its electrical features. It contains a small generator which is capable of delivering currents of infinitesimal amperage but at potentials of from 50 to 200 volts. The generator is driven by pressing a lever beside the handle, which lever operates through a chain of gears.

**Eddy Current Braking Devices.**—Some experiments were recently conducted at the University of Breslau by G. Hilpert and M. Schliecher on eddy-current brakes, consisting of iron rings facing, at each extremity of a diameter, a pair of magnetic poles. Such brakes were tested up to 30 horse-power with a circumferential velocity of 17 meters per second. The effect of various excitations of the magnets and speeds on braking power were illustrated by diagrams, and compared with theoretically determined results. It appears that such brakes can dissipate about the same power within a given mass of material as friction brakes. The cost is somewhat higher, continues *The Electrician*, but there are advantages, such as smoothness of running and convenience of control.

**Animal Electrocution.**—Recently, at a Los Angeles motion-picture colony, there took place an interesting electrocution, the victim in this case being a big leopard which had been employed filming so-called "animal stuff." Because of the treacherous attitude of this leopard, it was decided to execute him before injury befell any of the players. At first shooting was decided upon, but in view of the extreme beauty of the animal's pelt, electrocution was finally adopted. A large steel plate was placed on the floor of the cage, and a wire fastened to the animal's leg. When the leopard was finally coaxed over to the steel plate, the 6,000-volt current was switched on for an instant, resulting in the immediate death of the erstwhile motion-picture performer.

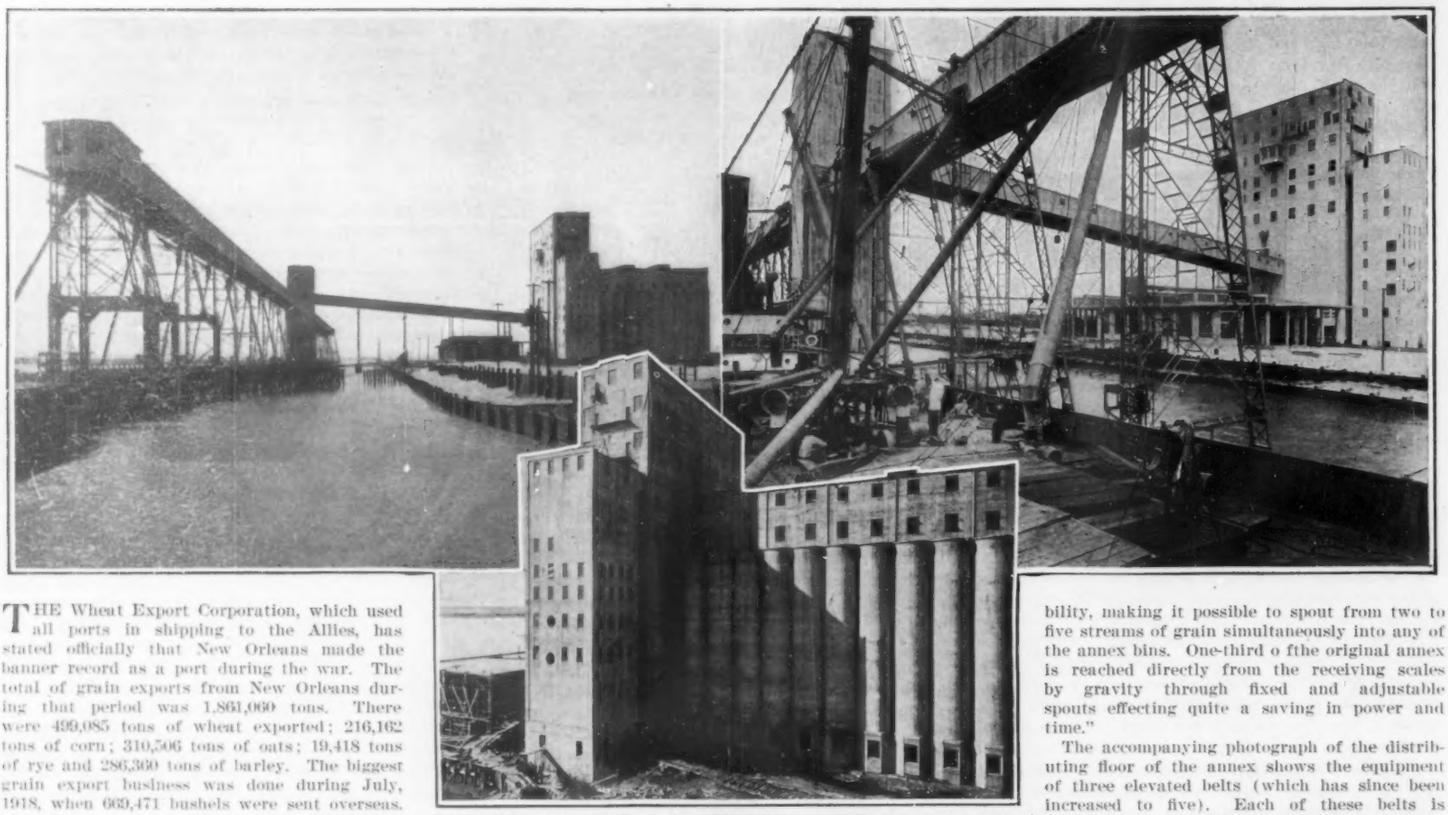
**Amateurs and Vacuum Tubes.**—For a while after the raising of the ban on amateur radio reception, it appeared as though it would be impossible for amateurs at large to secure vacuum tubes. If there is one thing that is characteristic of the radio amateur it is his insistence on all that is new and most efficient. Thus most amateurs refused point blank to return to the simple receiving sets and crystal detectors of prewar days, and began a nation-wide search for vacuum tubes. These vacuum tubes, however, were the center of extensive patent litigation, and could not be obtained by the amateur. But because of the insistent demand, the owners of the patents finally came together and decided on the release of a well-known type of vacuum tube, which is now available to all amateurs, and at a price which is not thought to be excessive.

**Electric Furnace Regulator.**—In *La Nature* an account is given of an automatic regulator for low-temperature electric furnaces, the invention of which is ascribed to M. Lequeux, whereby the temperature is accurately controlled. The device consists of a glass tube inclined at 30 deg., and connected at its upper end with a vessel containing a fluid which undergoes considerable dilation under the action of heat. The lower end of the tube connects with a vertical cylinder containing mercury in which is an adjustable piston. In the sloping tube, where the mercury enters up to a certain height, are spaced platinum contacts connected with points on the coil of a rheostat. The device is placed in the furnace, and when the latter is cold the platinum points are short-circuited by the mercury. The furnace, therefore, receives the full current. With a rise in temperature the liquid in the upper vessel expands and forces down the mercury, thus putting into circuit a succession of the various sections of the rheostat connected to the platinum points and diminishing the current. The device is intended primarily for laboratory furnaces heated by electricity, but the same principle may be applied to other forms of apparatus so heated.

# Handling Grain by the Boat-Load

## Machinery Installed at New Orleans for Keeping Down the Shipping Costs

By Rozel Gotthold



At the left, a general view of the New Orleans public elevator, marine tower and galleries; at the right, a ship that has just been loaded, showing spouts, etc.; in center, the elevator building with the circular bins

THE Wheat Export Corporation, which used all ports in shipping to the Allies, has stated officially that New Orleans made the banner record as a port during the war. The total of grain exports from New Orleans during that period was 1,861,060 tons. There were 499,085 tons of wheat exported; 216,162 tons of corn; 310,506 tons of oats; 19,418 tons of rye and 286,360 tons of barley. The biggest grain export business was done during July, 1918, when 669,471 bushels were sent overseas. One of the greatest achievements of the port of New Orleans was the shipping out of 27 full cargoes of grain, averaging 210,000 to 574,000 bushels, with nineteen hours for clearing each vessel.

The Public Grain Elevator is the greatest contributing factor to the quick turn-around of vessels in port. This enterprise is owned and operated by the Board of Commissioners of the Port of New Orleans. It has a storage capacity of 2,622,000 bushels; an unloading capacity from cars of 200,000 bushels per ten-hour day; an unloading capacity from river barges of 60,000 bushels per ten-hour day; and a delivery to vessels of 100,000 bushels per hour.

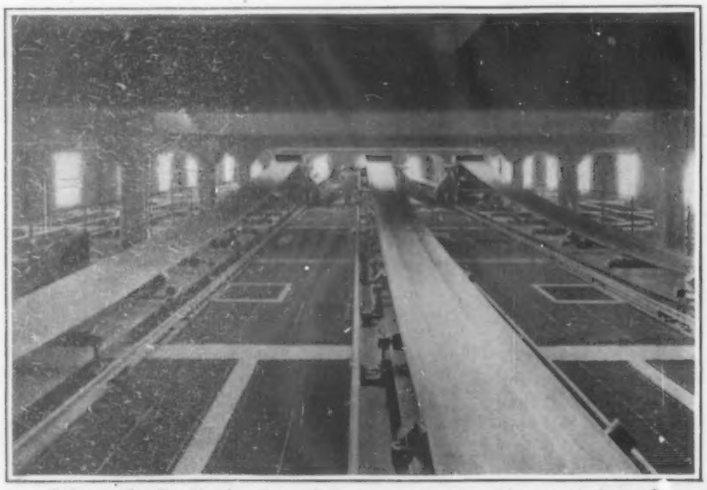
The elevator is equipped with four shipping legs and two receiving legs, each having a capacity of 25,000 bushels per hour; and one utility leg with a 10,000-bushel hourly capacity. A study of the distribution of grain throughout the elevator offers interesting matter for observation in its extreme simplicity and remarkable flexibility. It is also one of the great points of difference between the New Orleans Public Grain Elevator and other elevators, a difference based primarily upon the fact, that, as Mr. Charles F. Sanford, the Superintendent, says, "It is an elevatorman's elevator and not an engineer's elevator." The plans for handling were jointly the work of a committee of three practical men from the New Orleans Board of Trade, and the engineers. The plan for distribution was the work of the Board of Trade Committee; it calls for a simple system of elevated belts with spouts over the storage. "It has," says Mr. Sanford, "wonderful flexibility, making it possible to spout from two to five streams of grain simultaneously into any of the annex bins. One-third o fthe original annex is reached directly from the receiving scales by gravity through fixed and adjustable spouts effecting quite a saving in power and time."

The accompanying photograph of the distributing floor of the annex shows the equipment of three elevated belts (which has since been increased to five). Each of these belts is furnished with a tripper, making it possible to trip grain to the different spouts.

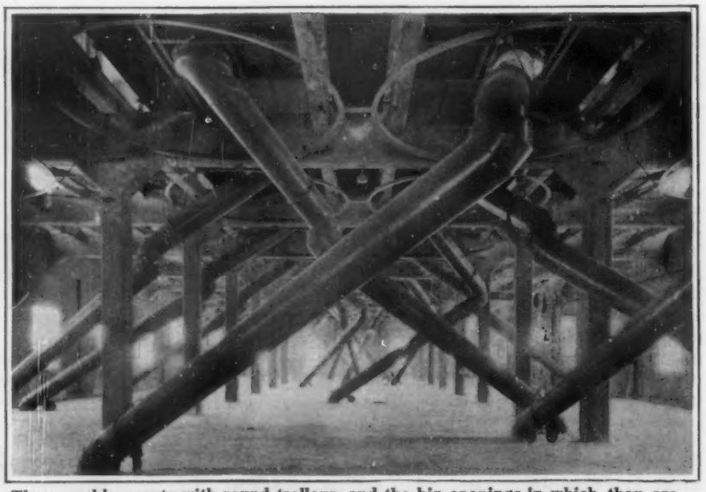
Underneath this floor is the bin floor, having the equipment of movable spouts. The picture shows the round trolleys overhead, upon which the spouts swing. The nozzles of the spouts are seen inserted in the openings in the floor, underneath which are the bins. A workman sounds the grain in the bin, and if it is full, he lifts the spout by means of the handle near its bottom, rolls it around very easily by means of the pair of iron rollers seen in the picture, and inserts its nozzle in any convenient bin entrance. There are over 300 bins in the entire plant, some having a capacity of 12,500 bushels, smaller ones holding 2,900 bushels of grain. The bin floor is 85 feet in height.

The third picture shows the grain elevator, the

(Continued on page 239)



Belts on the distributing floor of the annex, showing trippers at the ends for moving grain to different spouts



The movable spouts with round trolleys, and the bin openings in which they are inserted for action

# From the Frozen Arctic to the Polisher's Bench

## The Rôle Which Walrus Hide Plays in Giving a Fine Finish to Metals

*WHEN we read of leather from the seas, we are apt to think that this is a proposition with no precedent. As far as shoe leather is concerned, perhaps it is. But for a long time we have been quietly getting leather from the walrus for a different purpose. The fact is, this solemn-visaged tusker has a hide so hard that it is used for grinding fine metal articles of every description down to a very smooth finish! This article tells all about it.*

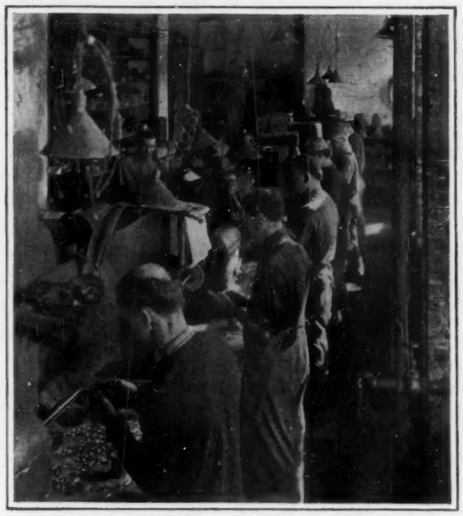
THE ice fields and the waters of the Arctic are thickly populated with herds of walrus, somewhat similar in shape and general appearance to the seal, but much larger. While the animal in question is sufficiently familiar, at least in pictures, to lead to the designation "walrus whiskers" for strikingly long and drooping hirsute adornments, nevertheless, there are a good many things about him which are not generally known.

The walrus runs from 12 to 15 feet in length and weighs between 1,500 pounds and a ton. His tusks measure 10 or 20 inches long, and in early years afforded the principal reason for hunting him. His skin at that time had no commercial value that amounted to anything, being used only locally, by the Eskimos for tents and other coverings and by whalers to protect parts of their ships from injury on contact with ice. But today, in addition to certain other uses, it is found that walrus leather, when properly tanned, on account of its tough fiber and extra thickness is superior to any other medium for polishing metals of every kind.

Closely and firmly grained, the tough flexible fiber of this leather will hold in its meshes such materials as pumice, emery, crocus and other abrasive or polishing substances. When to this its own inherent and peculiar abrasive qualities are added, there is a medium which will produce on any metal a cleaner and smoother surface, a more durable and brilliant mirror polish, than can be obtained from any other agent.

Accordingly the hunting of the walrus now goes on apace, being carried on mostly as a side line by whalers. The walrus is ordinarily killed while resting or sleeping on the ice. The ship is anchored at some distance so as not to disturb the animals, and a boat puts off for the ice-cake upon which they have been observed. In spite of the utmost care with which this approach may be made, some wise old walrus will usually detect a noise and raise his head in investigation. This is the signal for the men in the boat to drop their oars and become perfectly motionless, floating with the wind until the alarm subsides. It would seem that the walrus is altogether of too trusting a disposition for his own good; for even after the hunters have got within shooting distance and dispatched one of the herd, a repetition of these 'possum tactics ordinarily suffices to restore the calm of the animals.

This is a rather necessary item of the hunters' procedure, for if alarmed to the extent of taking the water, the walrus affords a much more difficult and dangerous chase. The marksman has to stand in the bow of the boat, rifle in hand and harpoon beside him. The harpoon is attached to an empty cask by a rope. The boat is maneuvered as close to a floating animal as possible, and the hunter lets fly with the rifle and immediately thereafter with the harpoon. This is necessary, in order that the walrus, if actually killed, may not sink and be lost. If the harpoon misses and the walrus is only wounded, not killed, there is usually an exciting time ahead for the boat crew. The walrus is a good deal like the grizzly bear; he is by nature rather tolerant of other people, but when wounded and at bay he is a dangerous antagonist. Many times a boat has been crushed by a blow from the tusk of an infuriated walrus.



**Making polishing wheels of walrus hide**

By way of drawing further analogy from the field of quadruped natural history, it may be remarked that the walrus has an armor almost as effective as that of the rhinoceros. In fact, like the big brute with the horn, he can be killed only by a shot that penetrates a single spot—in the case of the walrus, at the base of the skull, where this joins the neck. Elsewhere the skin is amply able to halt a bullet before it comes to a vital spot.

The hide of the walrus runs anywhere from half an inch to an inch and a half in thickness. In fact, so variant will a single skin be that the trade has built up the custom of quoting thickness by measuring a specified point at the middle of the back. But a wheel cut from any part of a good skin, regardless of what the local thickness be, gives a solid polishing surface of commensurate width, and insures an even friction on any surface to which it is applied. Manufacturers of silverware, cutlery, firearms, lighting fixtures, dental and surgical instruments, etc., use the walrus leather to give their product a high-grade appearance and finish. The skin can also be cut in strips and mounted on wooden wheels, giving a polisher whose life is a function of the thickness of the hide employed in its construction.

The fine photographs which adorn this page were originally obtained by Anthony Fiala, the Arctic explorer. From his hands they passed into the possession of the firm which makes the leather polishing wheels; and it is by courtesy of Mr. Willard H. Platt, of this concern, that we are enabled to present them here, together with much of the data given.

### Optical Tests Upon Quartz

AS a general rule, the optical purity of quartz crystals is tested by examining them in the direction of the optical axis. For this purpose the Norremberg apparatus is employed or in other cases a compensator, and the tests are made by white light or sodium light. A French scientist, M. H. Buisson, proposes to employ the mercury arc as a source of light, as it gives several simple radiations which are quite distinct and easy to separate. The ray of light passes from the source through a suitable diaphragm, then traverses a polarizing Nicol prism, then a lens which renders it cylindrical, and is concentrated at the focus of a second lens, near which is the analyzing Nicol prism. In order to test the quartz plate or other piece, it is placed between the two lenses and in the path of the beam of light. When the quartz is absent, if the eye is placed at the focus of the second lens, a uniformly lighted area is observed, which is extinguished if the Nicol prisms are crossed. The light reappears when the quartz piece is placed between the lenses, but the light area is not uniform, and the irregularities of the quartz are made evident. By making use of only one of the radiators emitted by the source of light, the luminous field has a single color, and possesses brilliant or dark places which indicate the place and form of the irregularities of the quartz. But if all the radiations are retained, even the slightest irregularities appear as regions of different color. In making these tests, it is not necessary that the plate should be cut, even in summary fashion, nor that the surfaces should be polished, and a roughly ground surface is not a hindrance. All that is necessary is to immerse the quartz piece in a tank with a liquid having the same index of refraction, and here the surface grain will disappear, as concerns optical effects. This gives an advantage in being able to test quartz pieces in the rough state, and they can be examined in all directions.

**Bringing a carcass aboard after a kill in the water**

**Hauling a slaughtered walrus up on the ice**

# Merchant Marine Progress

## Some Details of a Performance That Has Shown Its Heels to Publicity

By C. H. Claudy

COMING so quickly from a position at the rear to take rank as one of the first of nations in point of merchant marine, the United States has outstripped in performance the knowledge of most of its citizens. Everyone knows we have a Shipping Board and everyone has heard that we built ships and then more ships, built them fast and built them faster, and that the results of our labors were the difference between starvation and keeping alive, as far as Europe was concerned.

But few know how this great fleet has been turned to peace-time uses. Not that there is any secret about it, but merely because publicity has not been able to keep up with performance.

Yet the amazing facts are there. We have now eight hundred and twenty-nine ships, government or government owned, aggregating four million two hundred and forty-eight thousand nine hundred and seventy-three dead-weight tons, at the present moment actually engaged in general commerce. This does not include more than fifty per cent as many more deadweight tons still in use by the army and navy or for overseas civilian food relief. Nor does it include ships owned by companies and so operated. These ships are the property of the United States, which has put them into service in general and specific cargo work to such good effect that there is a United States vessel carrying United States goods on regular schedule to every important port of entry in the entire world.

A rather different situation to that before the war, when practically all goods shipped from the United States to foreign countries traveled in foreign bottoms.

These ships are giving general cargo service on sixty-two regular lines, following trade routes which have been opened during the last six months. And we are promised that this is but the first step which will convert ocean tonnage, released from war labors, to those peace-time services which will put this nation back where it of right should be—in the forefront among the maritime nations of the world.

There is no reason and less excuse for any shipper in the nation to employ a foreign bottom to carry his goods. No matter where he wants to have them carried, a United States bottom will carry them there. Nor need he say that he must use a foreign bottom because of any particular port in this country being more convenient to his factory or mine or ranch. Our own boats now sail from many of our own ports, so that we serve ourselves not only with our own vessels, but in the most convenient manner with those vessels.

Note that the sixty-two lines thus established are regularly sailing on schedule, announced in advance. The great advantages of this must be apparent even to the non-shipper. If a man has a cargo or half a cargo of tin cans or pianos, going to anywhere, any country, and happens to strike a tramp ship also going there at the same time he wishes to ship, he can use it and care nothing for an announced sailing. But such coincidences are rare. Most shippers want to know in advance when they may ship, from where they must ship, and what the freight rate will be. The establishment of a regular cargo-carrying service serves the shippers thus, exactly as a regular train service from point to point serves his convenience when he would travel himself. Scheduling departures and approximate arrivals allows the shipper to sell abroad for future delivery with the reasonable assurance of being able to make such delivery within a specified time.

### American Ships That Sail the Seven Seas

The established trade routes cover the whole world. Thus there are forty-seven steamers sailing to the Argentine and they sail from New York, Boston, Mobile, New Orleans, Wilmington, Charleston, Savannah, Brunswick and Jacksonville. Two steamers go from New York to Pernambuco, Maceio and Bahia, North Brazil. Twenty-five sail to mid-Brazil (Rio and Santos), from New York, New Orleans, Wilmington, Charleston, Savannah, Brunswick and Jacksonville. Five steamers from New York and one from New Orleans make regular trips to the west coast of South America, ranging from Guayaquil, Ecuador, to Valparaiso, Chile. Two steamers go from New York to North Africa and Egypt; five from New York to the Dutch East Indies; two from New York to Bombay and other Indian ports; three from New York to Spain (Barcelona, Valencia, Cadiz, and Seville). Every two months a steamer goes from the metropolis to Danzig, and every six weeks one or two steamers sail out the Narrows to Constantinople and the Black Sea ports. Three steamers sail from New York to West Africa, two to South Africa, three to Australia and New Zealand, and three to China, Japan and the Philippines. Fifteen steamers leave the Golden Gate, one every ten days, for China and Japan, and two more from the same port go to Europe *via* the Far East.

We have a steamer from New York to Genoa, and one from Baltimore to the same port; while two serve Grecian ports from New York. To London we send six steamers from New York, three from Philadelphia, two from Baltimore and one from Norfolk. We send six to Liverpool from New York, two from Boston, five from Philadelphia, one from Baltimore, one from Norfolk and one from Galveston. New York says goodby to three ships clearing for Glasgow on monthly sailings, four to le Havre, and three to Bordeaux. The latter port is also served from Boston and Baltimore with two and one steamers respectively. New York sends two steamers to Marseilles and seven to Antwerp, while two from Boston, and one each from Philadelphia and Baltimore go to the same destination. Rotterdam sees New York ships to the number of ten and from Philadelphia, two. Copenhagen and Gothenburg are served by five steamers from New York while the West Indian ports are visited regularly by two steamers from Wilmington, two from Charleston, two from Savannah, two from Brunswick and two from Jacksonville.

*EVERYONE knows we have a Shipping Board. Everyone knows we built ships and more ships, built them fast and built them faster, until the result made all the difference between starving Europe and keeping her alive. But how many know that this fleet has been turned to peace-time uses? The amazing facts are there, but how many read them? The United States, swept from the seas in 1915, has now eight hundred and twenty-nine ships, aggregating four and a quarter million dead-weight tons. And these ships are not tied up to rot in our harbors—they are on the high seas, actually engaged in general commerce.*—THE EDITOR.

Meanwhile, the balance of the list of ships is engaged in going to every port of the world where a cargo can go—and the flag at the stern is the stars and stripes.

### Government-Owned, Privately Operated

It would be pleasant if it could be chronicled just what the future will hold for these ships, and the trade lines thus established. But to state this would require a prophetic vision of what the Congress is going to do. At the present time the ships are the property of the United States and by it given over to private organizations, shipping combinations, individuals, firms, partnerships, etc., under certain terms. The United States gets paid for the use of its ships; they are emphatically not, as some soap-box orators have stated, built by taxes and given to the wealthy to operate for nothing.

When a firm has satisfied the Shipping Board that it is financially responsible, experienced in business, and that it has the confidence of other business men, it is able to make a contract with the United States, through the United States Shipping Board Emergency Fleet Corporation, for the use of one or more ships. This contract is a new document in shipping annals, for never before has the United States engaged in shipping as a sort of half-partner in the firm. It provides that the Emergency Fleet Corporation "will man, equip, victual and supply the vessel, and provide and pay for all provisions, wages, and consular, shipping and discharge fees of the master, officers and crew and all cabin, deck, engine-room and other necessary stores and will exercise due diligence to maintain the vessel in a thoroughly efficient state, in hull, machinery, tackle, apparel, furniture and equipment for and during service."

On the other hand, the operator as agent for the Corporation must operate as the Corporation directs as to voyages, cargoes, priority of cargoes, charters, freight rates, etc. The operator provides and pays for fuel, fresh water, stevedoring, port charges, pilotages, agencies, commissions and consular charges except as specified, and all such expenses as usually are borne by the time-charterer of a vessel. It is the business of the operator to collect the freight charges and in such a manner as will insure to the Corporation its revenue from such freight charges.

For his labors and his capital invested the operator receives his pay in the form of commissions. Thus, on all vessels except oil tankers he receives a commission on general cargo of two-and-one-half per cent on the gross ocean-freight list. On bulk cargo he gets half as much, the term bulk cargo meaning one of which fifty per cent or more is loaded at and discharged at one port and covered by one bill of lading; also all United States Government cargoes when the vessel is exclusively so laden. The operator gets a port fee of $250 when coming into United States ports from foreign or dependency ports and a five per cent commission on all mail, express and commercial passenger revenue.

In a few words and short, the United States owns and "finds" the ship, the operator runs it, the United States gets the freight and pays the operator a commission on that freight.

### The Future of the Fleet

So far, this dual system has worked out as well with the United States as owner as it would with a private owner time-chartering the vessel to an operator. The speculative feature is pretty well eliminated from shipping operations, but at the same time, the risk of chartering a vessel of uncertain or weak ownership is also eliminated. If the operator is unable to take advantage of the fact that he may charge what freight rates the traffic will bear, and must charge what the Corporation says, he is also protected against an unseaworthy ship, against trouble with pay of officers and crew, against objections to food or findlings. And he has the greatest country in the world behind him, and the knowledge that though he, as agent, is the responsible head of the voyage, he has also all the power of the country back of him in any port he may enter, for this is not a privately owned but a government owned boat.

The freight rates established by the Shipping Board are published and anyone can obtain them at any time. Anyone may learn at any time just when a ship is to sail for any port, the probable time of her arrival, what space is available for his cargo, what it will cost to carry it. The United States is seeing that its ships are run more like a railroad schedule than anything else, and while of course breakdowns at sea and the unforeseen in storm or accident may prevent a vessel from keeping to schedule, the probabilities are much in favor of a ship sailing when it is scheduled to sail and arriving when it is scheduled to arrive.

It is the general consensus of opinion that this good start will remain a good start only if it have a different finish. It has been recommended to Congress that the ships be turned over to private enterprise by sale, according to certain carefully worked out plans, so that within a short period of years all this floating property shall belong to shipping lines rather than to the government. Just what disposition Congress will make of this recommendation, just how long it will continue what is in effect, if not in fact, a ship subsidy to operators, no man knoweth. But this much is certain. The government has demonstrated (1) that there is use and plenty of it for a great fleet of merchant marine flying our flag from our ports; (2) that it is perfectly possible to make money by operating these ships at fair freight charges, under existing laws; and (3) that there is no fundamental reason why this country cannot keep what it has gained in getting, through the war, a great fleet of cargo carriers. It is for intelligent action of the future to see that we do keep it.

# Correspondence

**The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.**

## The High-Price Controversy

[*We publish below a second communication from Mr. Hugo Bilgram commenting on the article entitled "Our High Prices—Have They Come to Stay?" which was published in our issue of July 5th. We also append a reply by Dr. Alfred J. Lotka, author of the article. With these letters we regret that we must bring this discussion to a close.*—EDITOR.]

To the Editor of the SCIENTIFIC AMERICAN:

In my comments on "Our High Prices," by Dr. Alfred Lotka, in your issue of Aug. 2, I stated the volume theory of money in words in which it is often presented, although Dr. Lotka had not stated it in those words. However, in his rejoinder he confirms his standpoint as a defender of that theory, and since I did not intend to criticize his wording as much as the spirit of his contention, his reply lacks force. Whether the theory is presented in one form or another, the spirit is the same, and if fallacious in one form, it cannot be true in any other.

The notion that the purchasing power of the dollar automatically adapts itself to the need of commerce so that the money in use just suffices to mediate the traffic is inconsistent with the fact that financial crises frequently occurred in the past, which proves that the volume of money was then insufficient for the demand, and Dr. Lotka can hardly deny that this notion is the basis of his argument.

Having been advised to study with care "The Purchasing Power of Money" by Professor Irving Fisher, will you permit me, Mr. Editor, to show the error committed in that work in the attempt to prove the volume theory? In my effort to do this as briefly as possible, I must refrain from lengthy citations, but shall strictly adhere to the gist of the attempted demonstration.

The derivation of that theory is based on what Professor Simon Newcomb termed the equation of societary circulation which in substance is this: The amount of traffic per year expressed in terms of dollars equals the flow of money during the same period.

The sum total of goods and services sold during a year may have a greater or less value according as the price level is higher or lower. Hence, if the traffic T, comprising all goods and services sold, is to represent the amount and not the value of the goods, it must be stated in terms of some invariable value unit, and this must be multiplied by the price level P, that is, by the value of that invariable unit in terms of the variable dollar unit, to obtain the total traffic expressed in terms of dollars. This traffic, therefore, equals P T.

The monetary flow during the same year is obviously the product of the volume of money, M, and the average number of times, V, that each dollar of money is used in paying for goods and services. It is M V, and the societary equation is $M V = P T$.

With certain qualifications, eliminating on the one hand those sales of goods that are not paid for in money, and on the other hand those transfers of money that are not payments for goods sold, and ignoring the difference in time of delivery of goods and final payment, this equation is axiomatic and cannot be contested.

But now the volume theorists continue to reason as follows:

The rapidity of circulation of money depends upon prevailing customs, upon current periods of paying salaries and wages, and so forth, and can therefore be considered a constant factor of the equation. The same is true for the annual traffic which depends upon the desire of the people to acquire goods offered in the market. Hence only M and P of the equation are variable, and a glance shows that when M is increased or reduced, the factor P, namely the price level, must rise or fall in the same proportion, other things remaining unchanged. This, then, is the mathematical demonstration of the volume theory.

But unfortunately it is based on "reasoning in a circle," in other words, upon a line of reasoning proceeding from premises in which the conclusion is already postulated. In assuming that M and P are the only variable factors of the equation, it is assumed that P is a function of M.

As a matter of fact, P is determined by the purchasing power of the metal gold that has been selected for our value measure and is therefore independent of M. This follows from the fact that the price of gold never changed in this country since the year 1879, when the redemption of greenbacks in gold was resumed; and from the fact that—barring slight fluctuations which can be readily accounted for—the values of the units of various countries maintain the precise ratio in which the respective notes are redeemable in gold in the respective countries. It is simply inconceivable that the volumes of money issued in the various countries keep such accurate pace with the varying purchasing power of the metal gold that the various value units maintain this mutual relation which must have been the case if the volume theory were true.

Moreover, the demonstration is founded upon the postulate that the annual traffic depends upon the desire of men to acquire goods This assumption does not tally with the facts manifested during periods of unemployment, when workmen cannot obtain things they need in exchange for their labor. Hence, instead of P being a function of M, it is T, and eventually V, that respond to a change in the volume M of money. In other words, the periodic contractions in T, known as stagnations of trade, and the incidental periods of unemployment, are the result of the inadequacy of currency for the needs of our commerce.

If this conclusion is correct—and I challenge successful refutation—the volume theory should be combatted to the last degree, because this fallacy is the only excuse for that mistaken policy of our legislators that impedes the issue of currency against adequate security, on the plea of guarding against "inflation." This impediment is the cause of business depressions, of unemployment and of many other industrial ills.

Philadelphia. HUGO BILGRAM.

The Editor of the SCIENTIFIC AMERICAN:

With reference to Mr. Bilgram's letter appearing in this issue, I might make the following remarks:

Mr. Bilgram speaks of "the notion that the purchasing power of the dollar *automatically adapts itself to the need* of commerce, so that the money in use just suffices to mediate the traffic."

There is no such notion expressed or implied in my article. On the contrary, the quantity theory of money is based on the simple fact that commerce *must somehow get along* with what money can be put in circulation.

As Professor Fisher devotes a special chapter (IV) in his book to financial crises it will suffice if I refer Mr. Bilgram to this on that subject.

Mr. Bilgram speaks of "traffic T" as one of the factors appearing in the equation of exchange, and says: "Hence if the traffic T, comprising all goods and services sold, is to represent the *amount* and *not* the *value* of the goods, it must be measured in some invariable *value* unit."

This is about as if we were to say: "If X is to represent the *height* and *not* the *weight* of a man, it must be expressed in terms of some invariable unit of *weight*."

The symbol T which occurs in the equation of exchange does indeed represent a quantity (of goods sold, etc.), and must be measured in units of quantity, namely pounds, tons, bushels, or working hours (for men's services). To be precise, T is defined as follows:

If a quantity $Q_1$ (e. g. pounds) of a commodity $C_1$ is sold at a price $p_1$ per unit (e. g. pound), if similarly a quantity $Q_2$ (e. g. bushels) of some commodity $C_2$ is sold at a price $p_2$ per unit (e. g. bushel) etc.: then

$$p_1Q_1+p_2Q_2+\ldots+p_nQ_n=P\ (Q_1+Q_2+\ldots+Q_n)=PT$$

in other words T is the sum of all the Q's, and P is a weighted average of all the p's.

All these things are set forth clearly in Professor Fisher's "Purchasing Power of Money," pp. 27, 30; and there would have been no need to repeat them here if Mr. Bilgram had attentively read even the first thirty pages of that book.

The fact is that Mr. Bilgram is not discussing the accepted quantity theory of money, but his own conception of it. He remarks: "Whether the theory is presented in one form or another, the spirit is the same." Mr. Bilgram here overlooks one important proviso: The spirit will be the same, *provided* the presentation is correct, clear, and free from ambiguity.

Mr. Bilgram's statement that the quantity theory proceeds on the assumption that only M and P are variable is simply incorrect. We may make this assumption for purposes of illustration (as was done in my article), just as in the gas equation ($pv = Rt$) we may assume the temperature $t$ to be constant, obtaining the simple relation of Boyle's Law. But this assumption is made for convenience of presentation only, and is not in any way necessary. We can argue just as well from the equation of exchange that if M and P are constant, T will vary proportionally with V.

In this Mr. Bilgram and I seem to be agreed, that the theory *as presented by him* is untenable. But he can hardly lay the fault on those who have developed or set forth the theory in its correct form.

I thank you for your courtesy in giving me this opportunity to reply to Mr. Bilgram in this issue.

Brooklyn, N. Y. ALFRED J. LOTKA.

## Franklin's Electrical Experiment

To the Editor SCIENTIFIC AMERICAN:

Referring to the editorial remarks headed "Benjamin Franklin Took This Risk" in the SCIENTIFIC AMERICAN of August 9, 1919., may I call attention to the following statements regarding the key experiment of Franklin given on pages 167-8, of "Principles of Aerography" (Rand McNally):

"The identification of lightning with electricity was the work of Franklin, and the classical kite experiment is described by him in a letter dated October 19, 1752 (old style). Very few investigators have repeated the experiment as described by Franklin, and, as a matter of fact, the results are somewhat different from those he described. He did not draw the lightning from the clouds, as is so generally stated, but did obtain *moderate induction effects; and these can be obtained without much danger on the approach of heavily charged clouds; but any direct discharge or flash of lightning will demolish both kite and string and probably injure the observer.* Thus at Blue Hill Observatory during a kite flight, March 6, 1913, while there had been the usual static discharges, there was no lightning and no thunder previous to a discharge at 12:41 p. m., when 1,500 meters of steel wire were volatilized and the observers stunned."

Accordingly it is in order to ask: Did Franklin take this risk? Were not the sparks drawn from the key on presenting the knuckle, due to an induced charge? Even in cloudless weather sparks can be drawn from insulated conductors raised in the air. In the well-known letter to Collinson, Franklin says: "As soon as the thunder-clouds come over the kite, the pointed wire will draw the electric fire from them and the kite with all the twine will be electrified, and stand out every way and be attracted by an approaching finger."

The description is somewhat vague, but if we take it to mean that the fibers of the twine stood out, this would simply show an increasing electrification due to an induced charge. When the rain wets the kite string, we then have a conductor; but if a discharge of any intensity had come down that wet string there would have been no string left and Franklin would probably have been seriously injured.

One sometimes sees on a bank note a picture of Franklin defying the lightning. There is the philosopher, standing *out of doors*, with the approaching cloud and lightning flashes such as never occur in fact. It is explicitly stated in the letter that the person holding the string "must stand within a door or window or under some cover so that the silk ribbon will not be wet." ALEXANDER MCADIE.

Director, Blue Hill Observatory, Readville, Mass.

## That Daylight Meteor

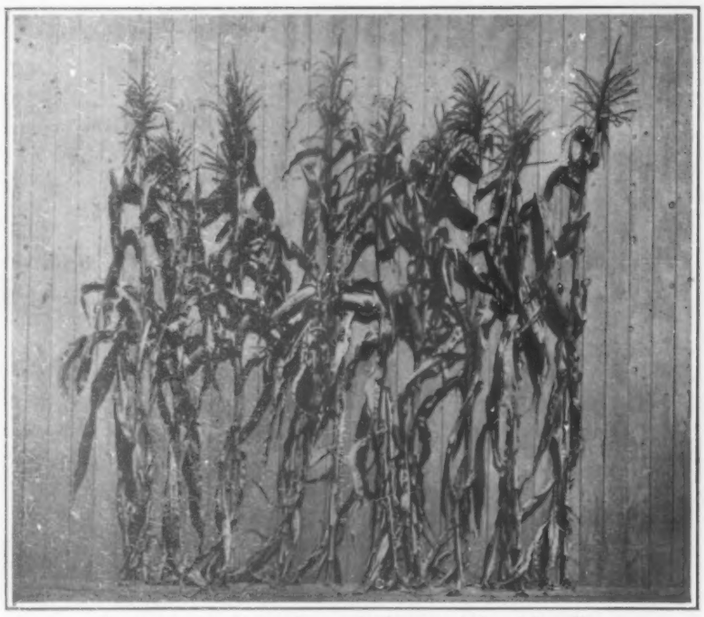
To the Editor of the SCIENTIFIC AMERICAN.

As a regular reader of the SCIENTIFIC AMERICAN, I was interested in the letter of C. G. Dickson, of Washington, D. C., which appeared in your columns on August 2nd, regarding a "daylight meteor."

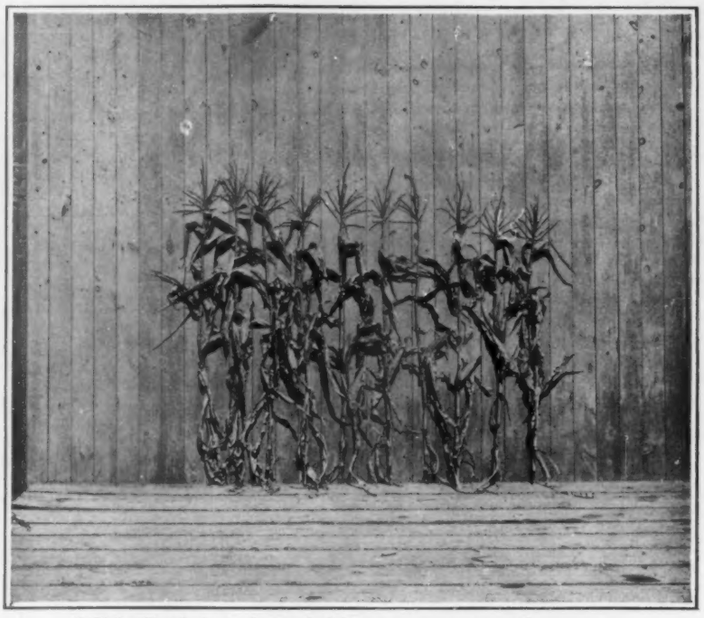
May I say that I do not believe Mr. Dickson has "suffered a hallucination," nor that his "eyesight is failing." While not so often observed in the daytime as at night, meteors have appeared in full light. I recall one I witnessed some years ago, in the summertime, about 5:30 in the evening. A firy ball appeared, passing through the zenith and travelling northward or northwest. It seemed about a third as large as the full moon, and was very bright. A trail of glowing ashes, gradually fading out, showed behind it for two or three diameters. The meteorite travelled quietly, and seemingly not very rapidly. I watched it during a passage of approximately thirty degrees, and until it disappeared behind a group of trees. I noted no explosion, nor did anyone else so far as I know.

Probably the reason Mr. Dickson was astonished at the sight was because the bright light of day usually dims any other light, and an aerial visitor would not be so conspicuous nor so easily seen.

Cherokee, Iowa. EUSTACE W. TOMLINSON.



Representative plants of a standard variety before inbreeding was begun



Self-fertilized plants descended from a common normal ancestor. Note the extreme uniformity

# Hybrid Vigor and Its Meaning

## Significant Experiments in Corn at the Connecticut Agricultural Experiment Station

By D. F. Jones

FROM the time of Moses it has been known that crosses between somewhat different animals may bring about an increase in size and constitutional vigor. The mule, the result of crossing the horse and the ass, is the classical example of this effect. For a long time it has been known to be equally true for the matings of individuals from unrelated herds of cattle, swine and sheep. The converse effect of a reduction in size and loss of vigor following close-mating has likewise been recognized. The opinions of the ancient Hebrews in regard to this matter, formulated in their code of laws, the Talmud, have been handed down and embodied in our statutes against the marriage of near kin.

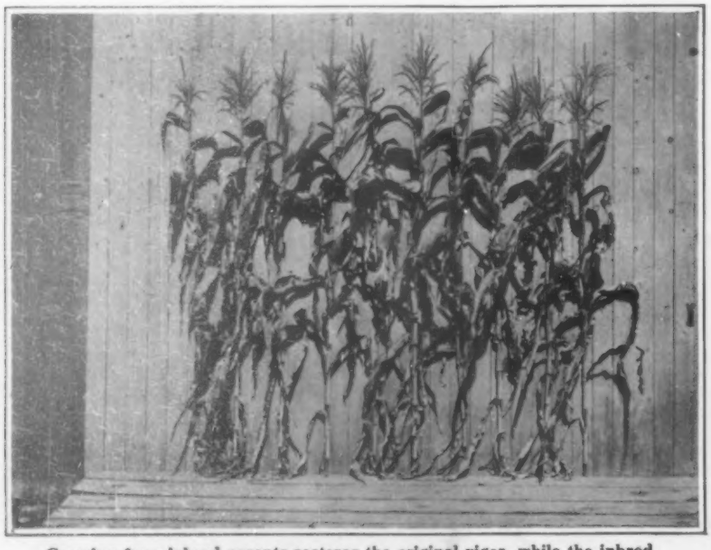
The same phenomenon occurs in the plant kingdom although it was not until after the essential similarity of sex in plants as in animals was discovered in the 17th century that hybrid vigor resulting from the crossing of different plants was put on record. So general is the invigorating effect of crossing that it has been found to occur in all the great plant groups above the mosses, and in animals in some of the lower organisms as well as the insects, birds and mammals, including nearly all the common domesticated animals and man himself.

The opposite effect when vigorous but related individuals are mated has caused many to believe that consanguinity resulting from relationship-marriages, or inbreeding as it is called by live-stock men, is inherently harmful and to be avoided if possible, as it was thought to lead to ultimate extinction. Darwin was one of the chief sponsors of this view and so widespread have become his ideas concerning evolution that it is to be expected that his opinions in regard to the effects of consanguinity should also be generally received. The conclusions of Darwin and his predecessors have been handed on in such phrases as "Nature abhors perpetual self-fertilization," or "It is intended that a sexual intercourse should take place between neighboring plants of the same species," and like many popular slogans they have carried conviction but confused the main issue.

It has remained for recent times to perform extensive and controlled experiments to determine the actual results of close-mating when long continued in order to base reliable conclusions and the interpretation of the results obtained has only been made possible by the recent great advances in the knowledge of the mechanism of heredity.

Plants in many respects are better suited for experiments of this kind than animals because they can be self-fertilized which is the most severe form of inbreeding that can be practiced and results in the greatest consanguinity. The corn plant was chosen because in its natural state it is almost completely cross-fertilized in every generation and would therefore be expected to show change under artificial self-pollination. Many exceedingly vigorous plants, both in the lists of cultivated crops and in the wild, are naturally completely self-fertilized in every generation and, of course, could not be expected to behave any differently when this process was continued artificially. The corn plant is also admirably suited for experimentation as it has many diverse characters which can be easily observed and measured.

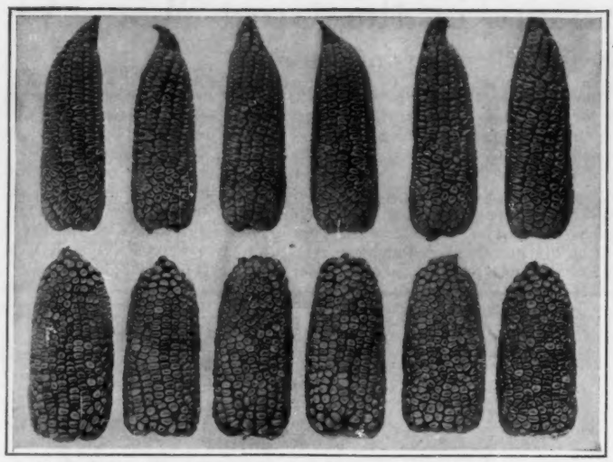
At the Connecticut Agricultural Experiment Station corn has been artificially self-fertilized for thirteen



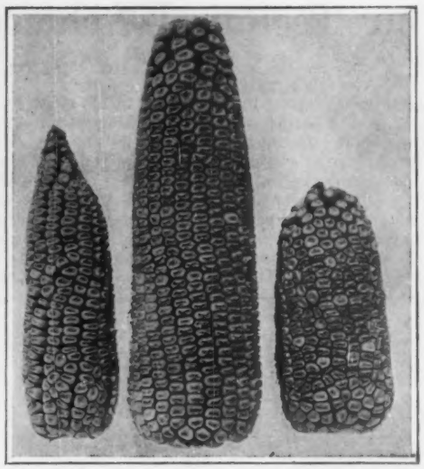
Crossing from inbred parents restores the original vigor, while the inbred uniformity is also retained for the first year

Inbred parents at right, offspring at left, second generation in center. The regained vigor and the inbred uniformity are not permanent

consecutive years. The outstanding results have been a decided drop in productiveness of grain, a decrease in size and a lessened ability to withstand unfavorable conditions. All the evil effects commonly attributed to consanguinity appeared during the course of this experiment. In the first years of inbreeding many very undesirable kinds of plants were observed,—dwarf plants, sterile plants, albino seedlings which could not grow beyond the stage made possible by the food stored in the seed, plants with yellow or pale green leaves instead of the normal dark green foliage. Other plants lacked brace roots and were unable to stand upright, some had reduced tassels and still others had crooked, contorted stems and fasciated ears. Many more peculiarities were found but these may serve as examples. Many of the plants possessing one or more of these unfavorable characters were unable to produce seed. But plants incapable of reproduction ceased their appearance after about six generations of self-fertilization and the remaining inbred plants reached a point beyond which there was no further reduction in size and vigor or alteration in structure. At this stage the self-fertilized plants were from one-third to one-half as productive as the original stock.



**Ears of two inbred lines, showing diversity between strains and uniformity within strains**



**Crossing restores size and vigor. Two inbred types, with their hybrid in the center**

During the past five years that these inbred types have been continued there has been no change in details of form, and they have remained on the same low level of vigor. The point to be emphasized, however, is that there is no indication that these continuously inbred plants are on the road to extinction, but on the contrary there is every reason for believing that they can be continued indefinitely by self-fertilization as long as anyone cares to propagate them in that way.

These inbred plants differ in a remarkable manner from the original variety from which they came and from all corn commonly cultivated. This difference is chiefly in their exceptional uniformity. All the individuals in an inbred line descended from a given normal ancestor are all just alike. In shape of tassel, position of leaves, and characters of the ear one plant is a replica of the other as if all were cut by the same die. There is some variation in size due to inequalities in opportunity to grow, but the similarity in every minor point is readily apparent.

Although within the lines, each descended from different individual plants at the start, there is great similarity, the differences between the several lines themselves are striking. For example, some strains have flat, uncolored cobs with small seeds. Other differences in the shape of the tassels, stalks and habit of growth characterize the various inbred lines so that they are at once recognized.

Just as they differ in visible characters so also are they unlike in respect to productiveness, ability to withstand unfavorable conditions, time of flowering and maturing, and resistance to disease. All these results of inbreeding can be summed up briefly in the simple statement that diverse types are finally produced which remain unchanged as long as self-fertilization is continued. Some are unable to survive but many can and of these some are clearly better than others. No single feature is common to all inbred plants, so that consanguinity does not produce any particular unfavorable effect. What is most important is the fact that the injury from inbreeding does not keep on accumulating but the inbred plants ultimately reach a stage after which there is no further alteration either up or down.

**Crossing combines the best from both parents. Inbred plants at right lack brace-roots, those at left do not branch from base of stalks. Their luxuriant hybrid in the center displays neither of these defects**

In the process of inbreeding a large number of decidedly unfavorable characters are eliminated. This is a decided benefit but productiveness and general vigor are also lost. Crossing, in proper combinations, restores immediately what is lacking in this respect. The beautiful conformity of the inbred parents is also retained in the first generation following the cross. Not only is size and strength restored by crossing but it may be increased over the condition of the variety with which the start was made due to the uniform excellence of the plants freed from many abnormal and undesirable characters in general. In this way inbreeding has great possibilities as an actual means of improving naturally cross-fertilized plants and bisexual animals.

For example, in maximum corn production the factors which count heaviest are a perfect strain of plants with each plant producing at least a moderately good ear of corn. If this were true for every field of this most valuable plant in America, an unbelievable increase in production would be made possible. But as it is, a large number of plants in a corn field produce either nothing or only nubbins. The corn which the farmer shovels into the corn crib looks far different from the prize-winning specimens exhibited at the corn shows. The prize takers are the result of an especially favorable inheritance accompanied by the best opportunity to grow. Both must work together.

By inbreeding, if carried on long enough, all the individuals of one consanguineous line are brought to have the same heredity. When two different inbred lines are crossed the first generation grown from the crossed seed are likewise hereditarily all alike, being the combination of uniform parental types. Since actually vigor is regained the uniformity of the first generation hybrid plants is an important factor in their good performance. In such hybrids there are no barren plants or weaklings. Not all individuals are absolutely alike because external conditions are never always the same. But a field of such plants differs in a very decided way from ordinary corn fields.

The uniformity characteristic of inbred parents and the hybrid does not continue beyond the first generation. Neither is the yielding power of such hybrids capable of fixation by any practicable means now known. If the hybrid individuals are selfbred or bred among themselves a rapid reduction in growth takes place which if persisted in will take the plants back to the level of the inbred parents which were used to make the cross. This has been abundantly demonstrated and therefore hybrid vigor is transitory in its

*(Continued on page 239)*

## Uprooting a Tree With Dynamite

WHAT is believed to have been the largest tree in the eastern states was blown up the other day at Spinnerstown, Pa.—a fate which the photograph taken before the blast indicates to have been long overdue. The tree was a chestnut, measuring 34 feet 6 inches in circumference at the base, and 11 feet in diameter. The height was not so excessive, being but sixty feet. In estimating the age of the tree at 400 years, representatives of the United States Forestry Commission declared it to be by all odds the largest chestnut tree ever encountered, and with little doubt the largest growth in the country outside of California.

*(Continued on p. 241)*

**The chestnut tree eleven feet in diameter that was blown up with over 200 pounds of dynamite**

**The debris from the explosion filled the crater with plenty of wood left over**

# Our Technical Achievements in the Great War—VI

## The Test of Two Hundred Days of Battle

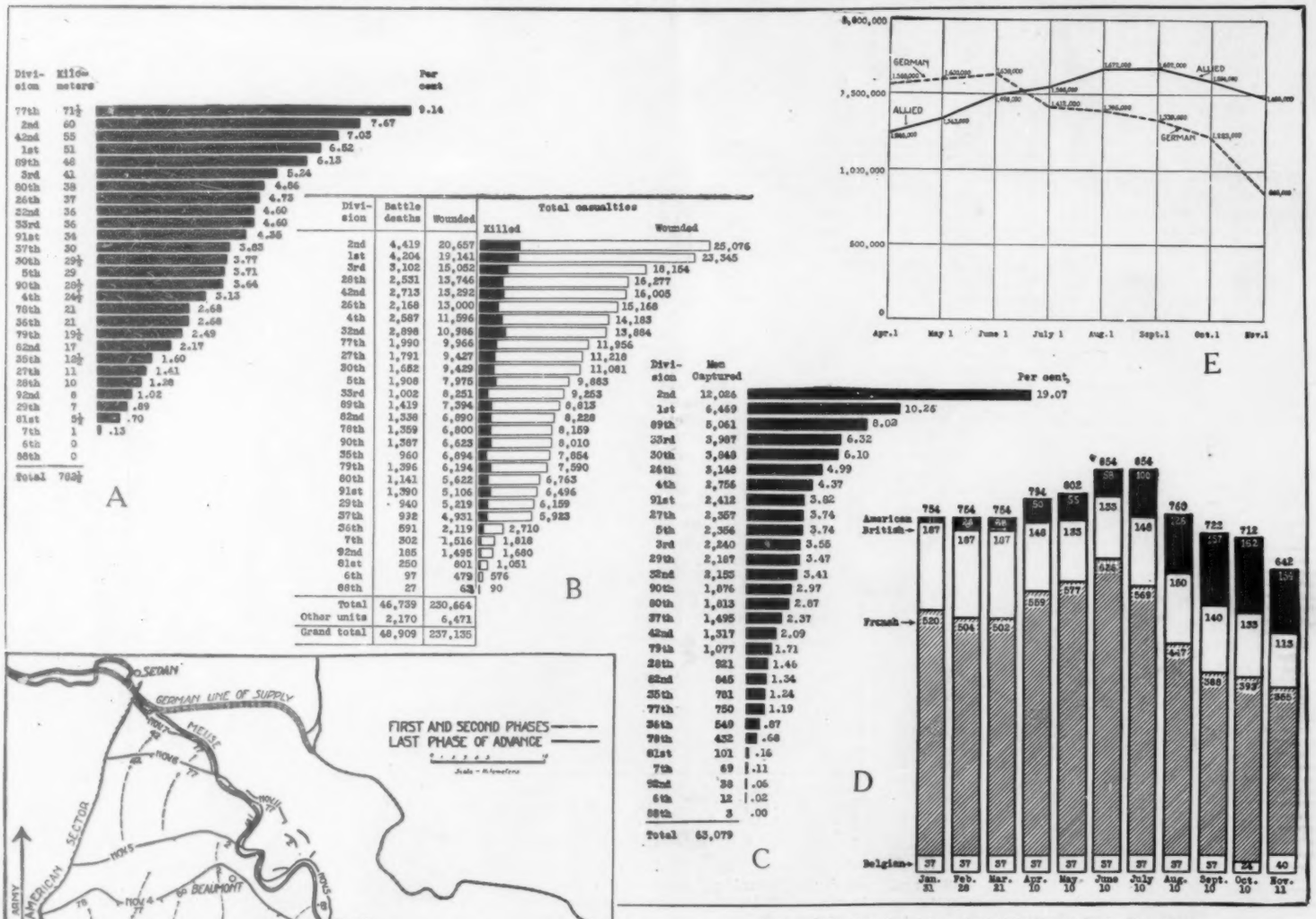
OF the American soldiers who reached France, two out of every three took part in battle. Of the two million and eighty-four thousand soldiers who landed in France, one million, three hundred and ninety thousand saw active service in the front line. These are the totals given in the statistical summary of the war with Germany, of which the present series of articles is a digest. Amid the mass of military information which has been published during and since the war, the layman may well be excused if he fails to carry in his mind even the salient statistical figures of that stupendous series of operations that will go down into history as the Great World War. Hence the compilation of these statistics by Colonel Leonard E. Ayres, Chief of the Statistics Branch of the General Staff of the Army, is timely and highly serviceable.

American combat forces were organized into divisions, each of which consisted of some 28,000 officers and men. The British division numbered about 15,000, and those of the French and Germans, about 12,000 each. We sent overseas forty-two American divisions and several hundred thousand supplementary artillery and service of supply troops. Of the forty-two divisions twenty-nine took part in active combat service: the other divisions were used for replacements, or they were just arriving at the front during the last month of hostilities. The battle record of our army in this war is largely the history of these twenty-nine combat divisions. Of Regular Army Divisions, there were seven, of the National Guard eleven, and eleven were made up of National Army troops.

American combat divisions were in battle for two hundred days, or from April 25, 1918, to the signing of the armistice. During this period they were engaged in thirteen major operations, eleven of which were joint operations with the French, British and Italians, and two were distinctively American.

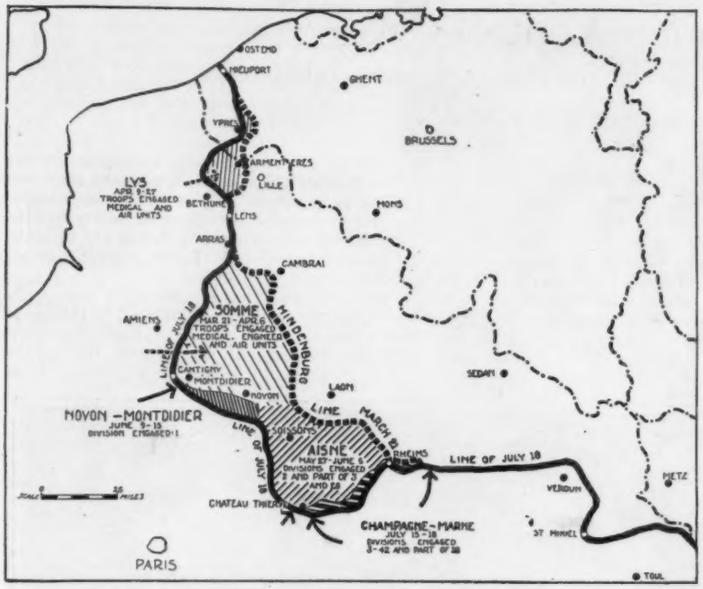
The time of their greatest activity was the second week of October when all twenty-nine American divisions were in action. They then held one hundred and one miles of front, or twenty-three per cent of the Allied battle line. The average advance for each division was seventeen miles, nearly all of it against a desperate enemy resistance. Our captures amounted to sixty-three thousand prisoners, one thousand three hundred seventy-eight pieces of artillery, seven hundred and eight trench mortars and nine thousand six hundred and fifty machine guns.

Of the two distinctively American major operations, the first was that at St. Mihiel, where they wiped out a salient which had existed throughout the war; the second was the great battle of the Argonne and the Meuse, when they fought their way against determined

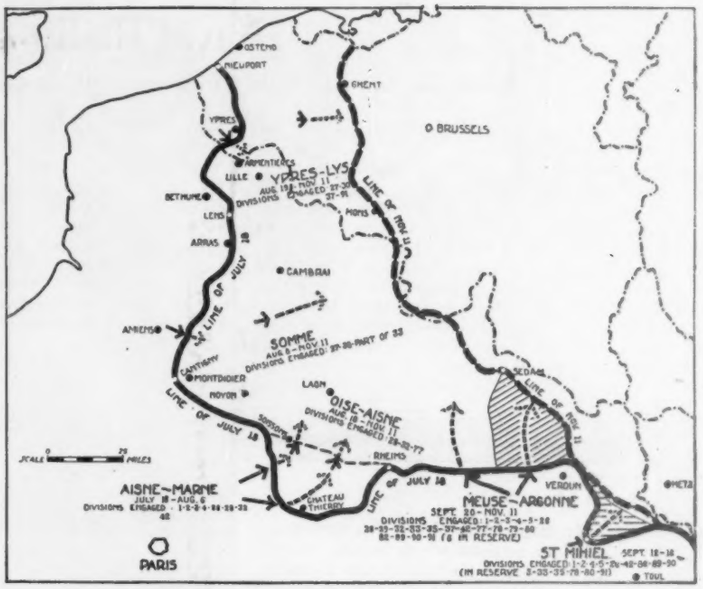



**Some of the details of America's big campaign in France.**

*A*—The distance, in kilometers, advanced by each American division.
*B*—The casualties suffered by each division.
*C*—Number of Germans taken prisoner by the various divisions.
*D*—The extent of front line, in kilometers, held at different dates by the forces of the several Allied nations.
*E*—How the rifle strength of the Allied armies on the Western Front caught and passed that of the Germans opposed to them.
*At left*—The battle of the Meuse-Argonne by successive stages, showing the locations of the American divisions and the ground gained in the several periods.




The five great German offensives of 1918




American participation in the Allied offensives of 1918

opposition through a wooded, rocky and stoutly-defended country until they reached and cut a vital enemy line of communication which served the easterly half of the active Western battlefront.

### Tipping the Balance of Power

An excellent measure of American participation is the effect caused by the rapid arrival of American troops on the rifle strength of the Allied armies. There is no better way to judge of the effective man-power of armies than to compare them on the basis of the number of riflemen ready for frontline service. In an American division of 28,000 officers and men, there are 12,250 rifles. With these facts in mind, attention should be given to our diagram showing the rifle strength of the Allied and German armies on the Western Front. The dotted line shows the German rifle strength at the beginning of each month, and the solid line, the Allied strength. On the first of April, 1918, the Germans had an actual superiority in rifle men of three hundred and twenty-four thousand. Their strength increased during the next two months but began to drop during June. At the same time the Allied strength, with the constantly growing American forces, was showing a steady increase, so that the two lines crossed during June. From that time on Allied strength was always in the ascendency and since the French and British forces were weaker in October and November than they were in April and May, this

(*Continued on page 241*)

## Sideways Launching of Ship With Steam Up

ALL of us are doubtless aware that in the West, and notably on the Great Lakes, many ships are launched sideways into the water instead of end on. The accompanying photographs of the launching of the "Lake Fugard" are entitled to a place in our columns, because of the unusual fact that the vessel was launched not only complete with engines, boilers and fittings aboard, but with coal in her bunkers and steam up in her boilers which, so far as our knowledge goes, is the first time such a thing has been done with a ship of sea-going dimensions.

The photograph of the ship, taken just before the launch, shows that after moving over the ways, there was a sheer drop of eighteen to twenty feet before she struck the water. In these sideways launchings the ship moves down the ways on an upright keel, but the instant that her centerline keel passes beyond the edge of the ways, which are just above the bulkhead of the dock, she begins to tip, and continues to roll over until she strikes the water and until the reaction of the water begins to restore her to an upright position.

In the case of the "Fugard," the momentum acquired on the ways and increased by the very considerable drop, caused her to heel so heavily that she reached an angle of seventy degrees which, under average conditions, would mean a complete capsize. As it was, the launching took place in a rather narrow slip, and the heavy rebound of the wave, set up when she struck the water, helped to throw the vessel back into a condition of equilibrium, and she righted herself.

In the case of the sister ship to the "Lake Fugard," which was launched soon after and in the same condition, with machinery aboard, the vessel keeled over to the extent of 73.8 degrees.

Nevertheless, the correspondent who sends us these photographs states, "She came back, bounding upwards like a rubber ball—all in six and one-third seconds." This vessel received some slight damage to her upper strakes—as well she might.

All in all, the accompanying photographs graphically report the unusual launching; and once more it is necessary to admit the extreme value of the camera as a modern news gatherer in all fields of human endeavor.

*At the left:* Steam up, just before the launch. *At the right:* The impact as the ship struck the water. *Above:* The "Fugard" heeling 70 degrees after a side launch.

**Launching a steamer in completed shape and with steam up**

# Naval Radio Remote Control

## What the Navy is Doing to Minimize the Nightmare of the Radio Operator—Interference

By Ensign P. H. Boucheron, U. S. N. R. F.

CONDITIONS have materially changed since the days of the first Marconi 10-inch spark coil with simple open circuit, plain spark gap, and aerial-ground arrangement, with wave lengths a secondary matter and tuning left to care for itself. In those pioneer days all transatlantic vessels approaching New York Harbor would endeavor as soon as possible to establish communication with the one and only New York radio station then in operation, irrespective of distance, zone or urgency, and thus there ensued a veritable medley of sparks sending messages in various languages. Owing to the lack of tuning and the "broadness" of emitted sparks, it was practically impossible to tune or "weed out" unwanted stations. Therefore the operator with the loudest spark or the one nearest to the coastal station would eventually succeed in despatching his traffic.

Such conditions were tolerated at that time because there were comparatively few vessels equipped with radio apparatus, and under normal conditions local coastal radio stations could handle the traffic of these ships without severe congestion or loss of time.

Today there is an entirely new order of affairs existing: radio communication is no longer a hit-or-miss proposition. Stringent laws and regulations universally recognized and adhered to have been enacted whereby all manner of radio stations are assigned definite wave lengths, ranging from 200 to 20,000 meters, the ultimate end of which is to prevent stations interfering with one another. When it is considered that at the present day there are approximately 10,000 vessels of various nationalities equipped with radio telegraphy, nearly 3,000 of which are under the American flag, it will readily be understood that close supervision and control of the ether is necessary in order that effective and dependable communication may be established between ship and shore radio stations. Even under present control, to the layman or the beginner "listening-in" at the receiving end of an installation in or about New York Harbor, there will be heard a regular babble of a dozen or more sparks of various musical tones, all using the standard commercial wave lengths of 600 meters; and it is only the adept and experienced operator who is capable of weeding all but the desired signals out of the chaos of transmitters employing that same and common medium—the ether.

The United States Naval authorities, upon taking over all American coastal radio stations during wartime, immediately foresaw what would take place once hostilities were at an end and general commercial radio traffic reopened to the public. Thousands of new vessels would be on the seas and, therefore, additional hundreds would call at American ports. Also, troop ships with hundreds of thousands of returning soldiers, eager to let the folks at home know of their arrival, would use the only way open to them by sending radiograms on approaching the home port. With several transports arriving each day, besides the many other American and foreign vessels calling at the port of New York to reopen passenger and freight traffic to and from foreign shores, radio telegraphy most certainly plays an important rôle; for in these enlightened days when the value as well as the safety secured by the use of radio is universally recognized in maritime circles, it is indeed a small and miserable tramp steamer which is not so equipped.

Unlike the telephone, telegraph and cable systems, in which direct communication is established by the use of individual wires or cables, radio telegraphy the world over must depend upon only one medium, that of the ether, which theoretically surrounds all space. It is therefore no easy matter to control radio operation in such a manner as to minimize interference, particularly so in the vicinity of a large and important port such as New York.

With this problem in mind the Naval Communication Service has established certain groups of radio stations near important shipping centers, which are operated by remote control from a central point. Such an arrangement makes it possible for the control station operator to use the shore transmitting station nearest to the vessel at the time of calling. In the case of New York, this control station, under the command of the District Communication Superintendent, is located near the Battery; in fact, it is installed in an office building with every available means of communication auxiliaries, such as telephones and telegraphs, making it an ideal communication center compared

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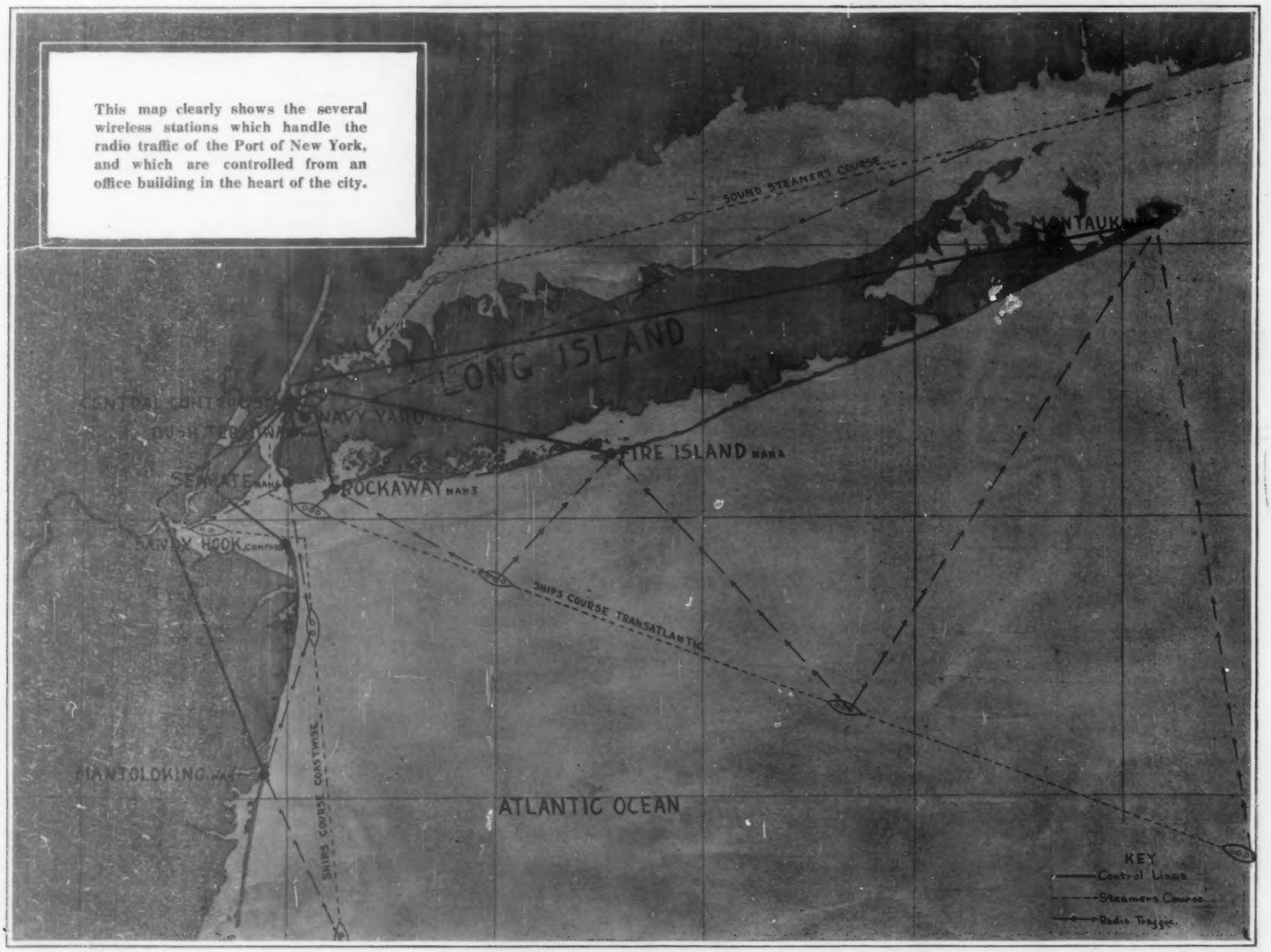


### A Collapse Like a House of Cards

THE "Sums" or wrestling amphitheater at Tokyo, Japan, was destroyed by fire a few years ago and in April of last year work was commenced on a large steel structure to replace the old building. The new amphitheater was to have the form of a huge dome with a capacity of 30,000 feet. One of the accompanying pictures shows the umbrella-like form of construction, consisting of curved girders meeting in a ring-shaped casting—temporarily supported by a light steel tower. Evidently insufficient precautions were taken to brace the structure against wind pressures during the erection of the steel—not an uncommon neglect in construction work. A gale sprang up while the work was in progress and the structure collapsed, killing one man and seriously injuring a number of others. The tangle of wreckage is interesting because of the peculiar spiral position taken by the steel girders.

The partly erected amphitheater wrecked by a gale

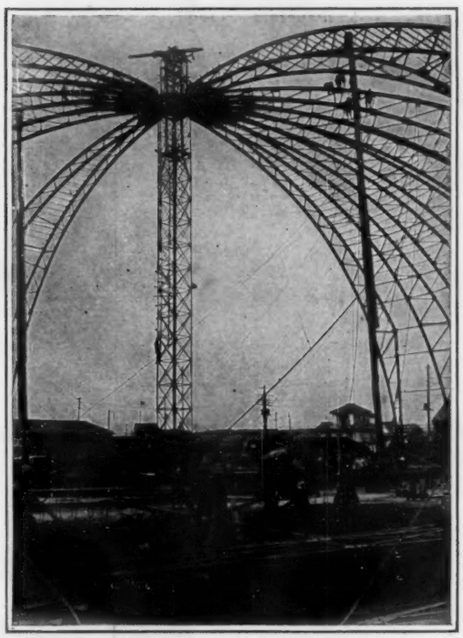
### A Primitive Idea in Hand-Operated Presses

THAT necessity is the mother of invention is nowhere more clearly manifest than in many simple contrivances devised by primitive peoples in different parts of the world. When one considers that these are for the most part made with only the crudest of tools and without the aid of machinery of any sort, the results obtained are surprising in their efficiency. It is evidence, too, that we, who boast of our civilization and are prone to look with not a little disdain upon the efforts of "the simple native," have no monopoly of inventive genius.

This simple and practical native press is made and used by the Indians of the low, wet countries of Central and South America in the process of making manioc flour, one of their chief foods. This flour is obtained from the juicy root of the yucca plant. The roots are first cut into cubes and then grated on boards set with rock crystals. This coarse grated meal contains a poisonous juice which must be extracted by pressure and it is for this purpose that the native press is used.

The press consists of a long tube or sleeve of finely woven, pliable basket work which is closed at one end and to which at each end are fixed loops of the same material. Two heavy uprights are set in the ground about five feet apart; one having a cross piece at the top and near the base a hole just large enough to admit a cross pole or lever; the other upright having crude notches cut about a foot apart in its side. The basket tube is first stuffed to its utmost capacity with grated root or meal and then hung with its open end up by the upper loop to the cross piece in the first upright. A cross pole, acting as a lever, is then passed through the lower loop of the tube and its end thrust through the hole near the base of the upright. By forcing the cross pole or lever downward, the basket tube is stretched and so caused to constrict. This constriction exerts a powerful pressure on the contents of the tube. The pressure is increased by further forcing the cross pole or lever down and is maintained by engaging the farther end of the cross pole in the notches cut in the second upright. By this means the amount of the pressure is controlled and is continued for any length of time.

The poisonous juice thus forced from the meal is drained off into vessels, the Indians having various uses for it, and the meal ground into flour in native mortars of stone.



Huge wrestling amphitheater in course of construction in Tokyo, Japan

### Mechanical Forestry

THE scarcity of skilled labor is felt throughout Europe, but in no country more than in France, and in no field of industry more than in the agricultural and related branches. Accordingly, anything which promises to increase the output of the man engaged in the exploitation of natural resources is eagerly sought after. A French contemporary, *La Nature*, describes and illustrates a machine-operated saw of novel design; and we have reproduced this apparatus on the cover of our issue this week.

It is pointed out that in scientific forestry not only is the saving of labor a desideratum, but operations must also be conducted with the greatest possible regard for the stand of timber in which work is being carried on. One point often overlooked is the desirability of leaving a stump which will not collect water and rot away as a consequence. This means that the tree should be cut down by a single cut, in a true plane, and a slightly inclined one. The new saw fulfills this requirement admirably.

The saw, as our cover shows, is a circular one. It is mounted with an electric motor on a carriage, which gives it sufficient portability to make it available wherever logging operations can be conducted. The dynamo outfit is on a separate carriage, and employs a gas engine as prime source of power.

The saw is carried on the end of an arm which projects from the front of the carriage. This arm is jointed at its base so as to move up and down, the outer end being provided with a clutch that engages the vertical toothed strip appearing as a prominent feature of the picture. This of course makes it possible to tilt the saw at any desired angle to the front of the carriage, and to hold it securely in any such position. In addition, there is a joint in the little housing above the saw-blade, so that the saw can be tilted sideways to any desired degree—in fact, it can be rotated through a circle. The combination of these two movements gives the effect of a universal joint, so that the saw can be made to operate in any plane whatever. It is an advantage to have this flexibility in the saw itself, rather than to depend upon movement of the carriage for any degree of adjustability; for the ground about the base of a tree is not always level enough to afford a reliable means of setting the saw at the desired inclination.

The first move in adjusting the saw to the tree is to set the blade at the proper angle. Then the carriage is wheeled by hand to the foot of the tree, and the motor thrown into gear by the lever seen on the right-hand shaft of the carriage. The motor, in addition to the transmission of power to the saw blade, is connected with the axle of the carriage by a series of gears, controlled from a crank at the side of the machine, and in this way the advance of the saw through the wood as it cuts is regulated to the immediate exigencies of the situation.

The circular blade of the saw is itself of a novel design. Every third tooth is a cutting tooth with its edge directed slightly upward, while the following tooth has its edge turned similarly downward. The result of the operations of these cutting teeth is to score two parallel tracks in the wood. Then the third set of teeth, which are miniature planes set with their blades vertical, come along and shave off the thin sliver of wood left between the two scores. The idea of this is that the cutting teeth act like a series of miniature axes, striking 3,600 blows per minute, and cutting the wood without lacerating the fibers. Then the planing teeth remove the material thus prepared for them.

The machine requires four or five horse-power which is delivered to the saw at a potential of 220 volts. For rapid work three operatives are called for—one in the shafts to direct the machine, one at the crank to throw the gears that control the forward motion of the carriage, and one to direct the fall of the tree. Production is about triple what it would be with three men armed with axes.

A simple native press which effectively squeezes the juice from grated cassava

### Arsenical Poisoning from Coal

ARSENICAL poisoning by coal and coal products was recently discussed before the French Academy of Science by Charles Richet in a paper. There had been an outbreak of serious symptoms at a briquette works. The name given to the disorder was the pitch disease. In many cases there was cutaneous cancer of a grave form, which even proved fatal; about 30 per cent of all the employees were affected in this way. A chemical analysis was made of the pitch and arsenic was clearly found in it, and traces were also discovered in the dust at the works, in the hair of the workingmen (and that in considerable quantities) and in the blood of most of them. It was evident, therefore, that they were under the influence of arsenic. It was ascertained that similar results have been met among tar distillers, road asphalters, tarred paper makers, and lampblack makers. The origin of this arsenic is to be sought in the coal. It has been long known that certain varieties of coal contain notable quantities of arsenical pyrites; but it is a new thing to find that arsenic is so widely to be found in coal.

# Inventions New and Interesting

*A Department Devoted to Pioneer Work in the Arts*

## A Bed-Mattress of Wood

DURING his confinement in a hospital a Frenchman, M. Delacourt, recently became rather thoroughly impressed—no pun intended—with the fact that the ordinary hospital bed left something to be desired, and set himself to whiling away his idle hours in an endeavor to meet what he visualized as the crying need. The material which he conceived of as the proper substitute for the bumpy mattress is not, at first glance, very promising, but it appears that he achieved success in his aim of constructing a mattress of wood which should be comfortable to lie upon. Of course in doing this he was counting upon the elasticity of thin strips of wood to give the necessary resiliency to what would offhand seem to be a pretty unpromising bed.

The wooden members of M. Delacourt's mattress are in general appearance quite similar to barrel staves. As the photograph shows, there is one set of these running across the bed from side to side; and for each stave which shows at the top of the bed there is one beneath, placed with its ends meeting those of its upper partner, so that the pair form a pointed oval. Each then serves as a brace for the other, bearing against the other at the point where they fit into the frame of the bedstead.

At the same time there is a second set of slats, similarly arranged, the length of the bed, fitting into the head-board and foot-board. These are inside the lateral set. A couple of the upper springs of the lateral set have been removed with the idea of showing the lengthwise members inside, but the intention exceeded the performance, and the latter cannot be seen. They are there, nevertheless, and form an important part of the outfit, since without them the mattress would be too "soft."

One of the prime talking features of this extraordinary wooden mattress is said to be the ease with which it can be made a little more or less elastic by removing some of the boards of one set, or by adding extra boards. It is also urged that it will not develop low places as the result of constant lying on one part of it—a fault which we must confess is possessed by all the orthodox mattresses which we have ever used.

A mattress of wooden slats, which is slept on just as it appears in the photograph

## For Better Pistons

THE proper fitting of piston rings is of course an essential of piston service, and it depends upon the grooves in which they fit being true. When they are not true, they must be made so, and this operation has usually been one entailing a good deal of fussing and dissatisfaction. The tool shown herewith makes it possible to true the grooves quickly and easily. The device is wired to the piston and run around the inside, in the groove, removing the high spots very effectively.

A handy little tool for truing the grooves of pistons

The revolving glass disk in this shield assures clear vision at all times

## Maintaining Visibility With a Revolving Disk

ONE of the most interesting inventions of late is the clear-vision shield now available for navigators and shown in the accompanying illustration. Briefly, this device consists of a shield containing certain navigating instruments, as well as a revolving glass disk which forms the clear-vision porthole. The glass disk is revolved at high speed by an electric motor, and the centrifugal force causes rain and snow to be swept off the glass, which always remains clear for use.

## An Automobile Repair Bench That Goes to the Car

CONVENIENCE is the keynote in the equipment of the modern automobile repairman. In fact, most of his equipment is mounted on wheels so that it can be pushed about to where the work is to be done.

Typical of such equipment is the accompanying automobile repair bench, consisting of a four-wheeled vehicle carrying tool-trays and vises. The vises are so arranged as to hold the small parts as well as the large ones, such as cylinders and transmission members. Thus the repairman has all the necessary tools and vises at hand for a quick and satisfactory job.

## A New Crop for America

QUININE is used in great quantities in the United States and an enormous sum is annually paid for the imported drug, most of which comes from South America, its source being the cinchona tree. That this money could be kept at home, and a valuable new industry established is the belief of many botanical experts, who point out that wide areas in the United States, throughout the Gulf States, and particularly in Alabama, seem well suited, both as to soil and climate, to cinchona growing. In South America, cinchona trees are found over an area of great diversity of soil and climate, the principal cinchona belt being a strip 100 miles wide and 2,000 miles long. Many trees are found growing at altitudes of 2,500 to 9,000 feet above sea level.

It is difficult to estimate the probable profits of growing an entirely new crop, but it is certain that if the trees would thrive, the profits would be large, as compared to most other agricultural enterprises.—*Emmett Campbell Hall.*

## The Wood Treatment Used in Denmark

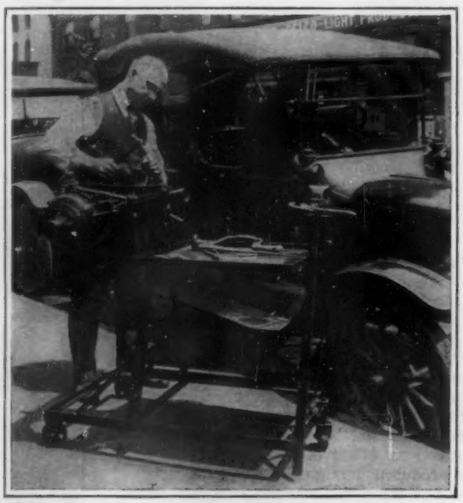
A PENCIL wood company recently organized in Koge, Denmark, to prepare woods, especially the cheaper kinds such as birch, ash, and elm, is making use of a patented method which is said to make them more durable. All wood treated by this process is called teakin wood. Certain changes in the character of the wood which normally take place only after many years of drying are by this chemical process produced within 24 hours. Thereafter, when the moisture that may still be left has evaporated, the wood becomes harder and more durable than by the aging process.

Teakin birch is a beautiful golden brown color, and when polished with potash it takes on a mahogany red hue. As soon as Canadian or Russian birch is obtainable, the process will be applied to boards and planks of this kind of wood. Teakin ash is a substitute for teak. Teakin elm has none of the disadvantages of natural elm. Teakin fir is of a uniform color all through and is used for office fittings and furniture and for veneering.

## A New Use For Selenium

A NEW practical application for the metal selenium, has been suggested by a French scientist, L. Ancel. It is the use of selenium cells as smoke recorders in chimneys. A selenium cell is mounted on one side of a chimney or flue; on the opposite side is fixed a lamp.

The amount of light falling upon the selenium and hence the resistance of the cell will depend upon the density of the smoke in the flue; the fire can, therefore, be controlled by the galvanometer records. Ancel describes the device very briefly; he mentions that the cell should admit of easy access so that the smoke settling on the glass cover of the cell may be wiped off, and also that selenium cells are very sensitive to infra-red heat rays as well as to light. It is not settled yet, in fact, whether the light effect on selenium is not essentially a heat effect; that point would in a way militate against the reliability of the selenium cell to act as smoke recorder. Another novel application of selenium cells, mentioned by Ancel, consists in controlling the contact sulfuric acid process by the degree of the transparency of the gases in the reaction tube. Ancel, however, does not give any technical data.



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# Recently Patented Inventions

*Brief Descriptions of Recently Patented Mechanical and Electrical Devices, Tools, Farm Implements, Etc.*

### Of Interest to Farmers

SHOCK LOADER.—E. O. STANCLIFF, R. F. D. No. 6, Bakersfield, Calif. The invention relates generally to conveyers, and more particularly to conveyers for shock loaders, the object being to provide a shock loader including conveyer teeth together with simple effective means for normally holding the same in such manner as to provide for their ready removal for purposes of repair and substitution of parts.

### Of General Interest

SCREEN, CURTAIN OR LIKE ARTICLE.—T. L. RICHARDSON, Brock, Neb. This invention while more particularly designed for use in connection with a curtain or screen is adapted for use in any structure having a window or opening adapted to be closed, shaded, or screened by sheet material. The invention particularly relates to screen adapted to be wound on a spring roller, and to provide means for maintaining the screen in flat form.

PAPER DUSTER.—H. A. MILLER, Box 31, Conneaut Lake Park, Pa. The invention relates to protecting devices for clothes and particularly to what is sometimes termed a duster, the object being an arrangement formed of paper which will protect the garments thoroughly and by reason of its cheapness may be discarded after one using. The covering is in the form of a cape arranged to be substantially sealed at the top and front openings so as to prevent dust from being deposited on the clothes of the wearer.

SUBMERSIBLE GUN-MOUNT.—I. LUDLOW, 1540 Aeolian Hall, 33 W. 42 St., New York, N. Y. Among the principal objects which the invention has in view are to provide ordnances disposable in the open sea and visible only at the moment of discharge, to provide submersible mounts for heavy ordnance, to provide means for mounting ordnance in swinging submersible mounts so arranged that at the moment of discharge, the ordnance settles below the surface as a result of the discharge, and to provide means for pointing the ordnance mechanically.

SHOE PROTECTOR.—P. CITRON, 470 E. 10th St., New York, N. Y. Among the objects of the invention are to provide an article of suitable flexible material which may be conveniently and quickly applied as a protecting covering for the shoe to keep the foot warm in cold weather. A further object is to provide a combined protector and anti-slip device. For this means there is provided a series of projections around the edge of the portion extending under the shoe.

STOP FOR HOLLOW TILES.—O. D. MOCK, 1417 Starks Bldg., Louisville, Ky. Among the objects of the invention is to provide a simple and reliable closure means for the end of a hollow tile that is placed in proximity to a space into which plastic concrete or the like is to be poured in the formation of a beam, or other building element, in order to prevent the plastic material from flowing into and more or less filling the cavity of the tile, the invention also provides a positive interlock between the end of the tile and the beam.

TUBE SQUEEZER.—J. J. MUCHER, 2173 Pacific St., Brooklyn, N. Y. This invention relates to a device which will squeeze a collapsible tube for forcing the contents thereof out of the discharge opening without requiring the operator to hold the tube during the squeezing operation. The device is formed with a toothed roller whereby the tube is not only collapsed but is indented and thereby fed automatically through the machine as the same is operated.

WALL CONSTRUCTION AND CHANNEL BRICK OR BLOCK THEREFOR.—A HAR DONCOURT JR., 8539 106th St., Richmond Hld, N. Y. The object of this invention is to provide a channel brick and a hollow wall construction embodying such channel brick, which construction shall be practicaly moistureproof and effectively prevent the penetration of moisture from the outer to the inner face thereof,—and one in which the longitudinally extending mortar joints are separated by longitudinally extending air spaces.

DOLL AND METHOD OF APPLYING HAIR TO DOLL'S HEADS.—I. GOLDMAN, care of Hayman and Appenherrn, 105 E. 16th St., New York, N. Y. The invention has particular reference to coiffures or hair dressings for dolls or other artificial figure made to simulate human beings More especially the invention relates to a process of applying either natural or artificial hair to heads of dolls so as to present in such figures the most pleasing effedct. By this process strands of hair are adhesively secured to the head at one end, such strands being dressed and trained to cover other portions of the head and adhesively secured thereto at points intermediate their ends

RELEASING-PENHOLDER.—J. GRECO, 482 W. Broadway, New York, N. Y. Among the objects of the invention is to construct a penholder in such form as to provide for the easy, reliable, and sanitary releasing of the pen point therefrom after it has been used for any length of time without resorting to a special tool or soiling one's fingers. The device is simple, relatively cheap in construction and effective in operation.

SAFETY-RAZOR BLADE.—A. H. BRYANT, 17 Battery Place, New York, N. Y. The invention has for its object the provision of a construction wherein a very high grade blade may be produced having overhanging shoulders. Another object is to provide a safety razor blade with a back mounted thereon formed with an extension projecting beyond each end so as to produce shoulders for the blade.

FIREARM.—W. E. ROSEBUSH, Appleton, Wis. The object of the invention is to provide a firearm arranged to permit of securely locking the barrel receiver to the main frame and to allow convenient disassembling of the parts for repairs cleaning or other purposes. Another object is to permit of adapting the magazine to long rifle cartridges as well as to short cartridges and without danger of the bullets jamming in the magazine. Another object is to cause the hammer spring to act on the magazine catch.

HOSE CLAMP.—I. HILL, 1135 Park Ave., New York, N. Y. Among the objects of the invention is to provide a clamping device for a hose or other purposes including an anchor device comprising a cradle having rounded concave bearing and a rocker cooperating with the bearing whereby the direction of strain applied to the band, or its equivalent, will always accomodate itself automatically to the most advantageous condition irrespective of the size or diameter of the hose encircled by the clamping band.

FISHERMAN'S FLY.—H. CASSEDY, SR., Brookhaven, Mississippi. The invention has for an object the provision of a construction which will imitate a natural fly in appearance and action when in the water. An object is to provide a body arranged with clamping sections for clamping a number of different wings, in this way only a small supply of bodies is necessary while a comparatively large supply of flies may be at the disposal of the fisherman.

MULTIPLE GUN.—E. HOLZWARTH, Miller, S. D. The object of the invention is to provide a multiple gun more especially designed for use on aeroplanes or marine vessels or for use in the field against aeroplanes, infantry, calvalry and other bodies and arranged to permit of firing bullets in a tubular or a conical path. Another object is to provide a single trigger actuating mechanism for simultaneously actuating the trigger of several machine guns to fire in unison, and to provide a single sighting means for the several guns.

ABSOLUTE HYGROGRAPH.—F. G. MCADIE, care of Blue Hill Observatory, Readville, Mass. An object of the invention is to provide a device by means of which a continuous record of the weight of water vapor per unit of volume in atmospheric air may be made. A further object is to provide a recording sheet by means of which permanent records may be made, this sheet having fixed scales indicating temperatures in various systems as for instance, absolute, centigrade, and Fahrenheit, etc., weight of dry air per cubic meter, weight of water vapor at saturation per cubic meter, and percentage of saturation at any temperature.

FURNITURE POLISH.—G. H. ALLEN, Clinton, N. Y. An object of the invention is to provide a furniture polish which when applied to furniture will clean the surface and leave the latter in a polished condition and which will also tend to render the varnish on the furniture more plastic and less liable to crack. A further object is to provide a polish which flows readily and does not require excessive rubbing to bring out the luster. The composition comprises a mixture of aqueous extracts of wood, sal soda, mineral oil, beeswax and alcohol.

### Hardware and Tools

WRENCH.—C. M. WILKERSON, Middlefield, Ohio. The primary object of the invention is to provide a device by means of which a firmer grip upon the article operated upon may be obtained. A further object is to so construct the wrench as to make it capable of use in connection with pipes and other cylindrical articles, in addition to its use with nuts and the like as an ordinary monkey wrench.

WINDOW LOCK.—J. E. PHILLIPS, 601 W. 139 St., New York, N. Y. This invention relates to window locks and has for its object to provide a locking bar which is simple and strong and formed so as not to readily get out of order. Another object is to provide a construction which is easily operated interiorly, but will not be readily observed from the exterior of the window, the locks being at the ends of the sash bar, instead of arranged centrally as is usually the custom.

### Machines and Mechanical Devices

SPONGING MACHINE.—B. CORTESE, 169 W. 18th St., New York, N. Y. The invention relates to means for operating or controlling the actuation of the rolls for the steam sponging of cloth. The object is to provide a motor or its equivalent for mechanically operating the rolls at any desired speed and in either direction whereby the work may be performed both expeditiously, and in the best interests of the fabric.

METAL CASTING MACHINE.—L. MANDELSTAMM, 143 W. 125th St., New York, N. Y. The invention relates to means for casting precious or other metals and has particular reference to dental work in the making of plates or teeth from gold or the like. Among the objects is to provide for making a cast, including the provision of a cup or receptacle for holding the mold and above it the metal which after being melted is to be delivered into the cavity. A plunger is provided to be brought down over the molten metal to force it into the cavity.

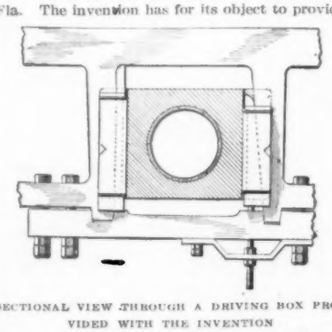
SEPARATOR.—H. H. SMITH, Magnolia Beach Wash. The invention relates to a separating apparatus more particularly intended for use in separating ores and the like, especially the separation of slate from quartz or slate from diorite. In general the apparatus is designed to separate approximately round, triangular, or cubical particles from flat or elongated particles, without reference to weight or other properties of the materials.

### Railways and Their Accessories

PLEASURE-RAILWAY.—P. F. MEYER, 414 Ave., N. Brooklyn, N. Y. The object of the invention is to provide a pleasure railway or roller coaster more especially designed for use in pleasure resorts, exhibition grounds and like places, and arranged to provide an exciting and interesting ride for the passengers. Other objects are to accommodate safely a large number of passengers in each car, and to prevent the car from jumping or leaving the track.

GRAIN-CAR DOOR.—R. C. LEITCH, 2010 E. 36th St., Kansas City, Mo. The invention relates to car doors generally, but more particularly to grain car doors, the primary object being the provision of a simple, strong and durable construction conforming fully to the requirements of a door of this character, capable of effective manipulation for the usual purposes, and capable of ready movement to and from operative position.

ATTACHMENT FOR LOCOMOTIVES.—G. C. ACKER, 1846 Hubbard St., Jacksonville, Fla. The invention has for its object to provide



SECTIONAL VIEW THROUGH A DRIVING BOX PROVIDED WITH THE INVENTION

a shoe and wedge for locomotive driving boxes wherein the shoe and wedge are steel, with an interchangeable cuff, or facing of brass or bronze on the wearing surface to permit the replacement of the cuff or facing when worn, without requiring a new shoe.

### Pertaining to Vehicles

AUTOMOBILE OR TRUCK WHEEL.—H. E. and P. R. SIMMONS, Huntington, Ind. This invention has for its general objects the provision of a puncture and bullet-proof wheel which is of inexpensive and durable construction, reliable and efficient in use, and so designed as to provide a maximum resiliency by the use of air under pressure without the well-known objections to the present type of pneumatic tires, the device is so constructed that it absorbs shocks and insures smooth running of the vehicle.

BUSHING PULLER.—F. X. ATZBERGER, P. O. Box 151, East Islip, N. Y. The object of the invention is to provide a bushing puller arranged to permit the user to conveniently and quickly remove a worn out or otherwise defective busning from its support with a view to replacing it with a new one. Another object is to permit the use of the bushing puller on the front spring perch of an automobile with a view to remove the bushing from the perch in case it is worn out by the bolt of the spring shackle.

METHOD OF MAKING PUNCTURE-PROOF-TIRE-TUBES.—G. F. ARMSTRONG, care of Armstrong Rubber Co., 132 Moore St., Garfield, N. J. This invention relates to puncture proof tubes such as inner tubes commonly used in pneumatic wheels for bicycles, motorcycles, automobiles or the like, and has particular reference to the manner of manufacture, with respect especially to the composition, the finished tube comprises an inner member and an outer member spaced from each other along the sides and tread portion forming a pocket filled with an annular mass of semi-fluid viscous composition, which in cross section becomes crescent shaped .

TRACTOR ATTACHMENT FOR MOTOR-VEHICLES.— M. L. ADAMS, 910 Stewart St., Seattle, Wash. The invention relates to tractor attachments for motor driven vehicles in general, but principally for farm work and consequently one of a rugged construction, which embodies means whereby the tractor can be turned within its own length simply by the manipulation of the braking devices. Another object is to provide an attachment which embodies a compensating or defferential gear whereby a uniform driving torque is applied to the axles at both ends.

AUTOMOBILE-LAVATORY.—W. A. DEHUFF and E. T. GRIFFIN, 2034 E. 30th St., Baltimore, Md. The object of the invention is to provide an accessory so mounted and constructed as to be capable of ready convenient use at all times without infringement upon the otherwise occupied car space or interference with its normal use. Another object is the provision of a lavatory which will be sanitary and normally conceal its true character, while exposed to full view at all times, will avoid detraction from the general appearance of the car.

DRIVING MECHANISM—F. C. GUERLICH, Ocean Drive, Stamford, Conn. Among the principal objects of the invention are, to provide mechanism with means for gradually varying the effect thereof, to provide means for differentiating the applied power to the operating conditions of the vehicle in which the mechanism is employed, to provide means for balancing the power applied and the resistance thereto as exerted, and to avoid loss through leakage of the power transmission medium.

### Designs

DESIGN FOR A FLAG.—H. M. HOLDEN, 175 Tounell Ave., Jersey City, N. J.

DESIGN FOR A BANNER, FLAG, PENNANT, SIGN, EMBLEM, OR ARTICLE OF A SIMILAR NATURE.—M. LEHR, 6 Ainslee St., Brooklyn, N. Y.

DESIGN FOR A BEDSPREAD.—M. OESTREICHER, 129 Ave. C., New York, N. Y.

DESIGN FOR A SAVINGS-BANK.—A. GOLDBERG, 714 Harris Trust Co., Chicago, Ill.

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### Handling Grain by the Boat-Load

(*Continued from page 226*)

marine tower and galleries. The incline gallery, leading from the marine tower to the plant, is equipped with four belts, each having a capacity of 25,000 bushels per hour. This may be discharged into one hold or split up and fed into four or more.

Much of the grain is received from cars; much of it comes down the river. For the purpose of receiving barge-brought grain, the marine tower is equipped with a pneumatic conveyor, which adapts itself readily to the rise and fall of the Mississippi River—a difference of about 20 feet. The pneumatic conveyor sucks the grain up to the top of the tower, where it is put into hoppers; then it is dropped to one of the four shipping belts running along the incline gallery into the workhouse. Here it is shot up to the top floor, through the garners into the hopper scales, and finally taken over the belts through the spouts into the bins.

The protection of the grain is guaranteed by a careful system of temperature reading. When 95 degrees is reached, according to the plant foreman, the grain must be cooled. This is done by lifting it out to the top of the plant, and dropping again, or by using a cooler bin.

The elevator is of steel and reinforced concrete and is entirely operated by electricity. It is said to be the cleanest in the world, due to its dust collecting system, which not only keeps it clean, but, by removing this danger of fire, gives to the elevator a most advantageous insurance rate for grain stored.

### Hybrid Vigor and Its Meaning

(*Continued from page 231*)

effect and for the most part incapable of fixation.

For many years it has been thought this stimulation from crossing was of a physiological nature resulting from the union of unlike hereditary complexes. It is a matter of common knowledge that the egg of most species cannot develop into an embryo unless fertilized by the male germ cell usually coming from a different individual. It was argued from this that the union of sex cells from unrelated organisms having diverse heredities would increase this stimulus to development. It is now believed that this is an unnecessary assumption as a more simple interpretation is at hand.

It was due to the Austrian monk, Mendel, that the first real beginning in the study of inheritance was made. While Balzac was writing that "hereditary is a maze in which science loses itself," Mendel in the seclusion of his cloister garden laid the foundation for this far-reaching subject and furnished the key to the problem of consanguinity. Mendel's great contribution was to show that visible characteristics are transmitted from generation to generation independently of each other and unaltered by the accident of having sojourned for a lifetime in a particular individual. But instead of all characteristics being transmitted independently as the work of Mendel first indicated, it has been shown by Bateson in England and Morgan in America that characteristics are carried in groups and that it is these groups of hereditary potentialities which Mendelize, that is, which shuffle themselves about and put themselves in different combinations.

These conclusions which have only recently been arrived at were first developed in England by the aid of the common garden flower, the sweet pea. Later the Columbia University laboratory chose an organism which proved to be admirably well suited for experimental work of this kind. It was the little red-eyed fruit gnat whose tiny presence warns the housewife that some of her fruit is spoiling.


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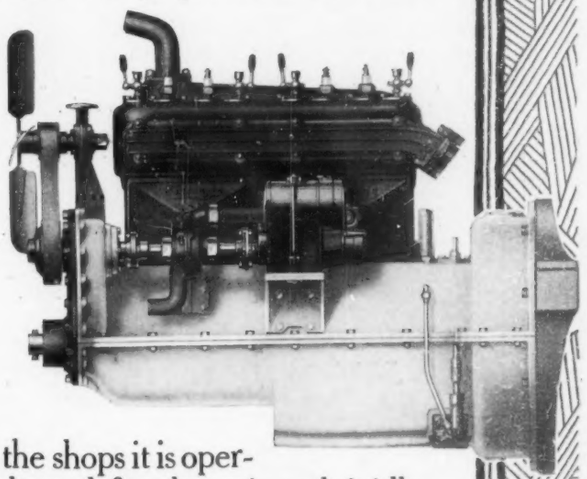

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Over one hundred inherited characteristics have been found in this insect. All these hereditary differences are determined by factors carried in four groups. Other animals and plants have different number of groups but the existence of such a method in the transmission of hereditary characters is rapidly being determined for many organisms.

This is the importance which these facts have for the inbreeding problem: when two races are crossed all the characteristics of both parents are transmitted to the hybrid offspring but many of them are unable to express themselves as they are hidden or covered over by other characteristics. In the majority of cases the more favorable characteristics tend to dominate in this fashion so that the progeny is better able to grow than either parent because it has the best of both parents to draw upon. But when the hybrid itself comes to reproduce, the unfavorable characteristics which lie dormant make their appearance in the progeny so that the extra growth and vigor of the hybrid is only temporary. When segregation comes in the production of the second hybrid generation some of the good qualities go to one individual and some to another. In other words, there is a reduction in size and rapidity of development when close-mating follows crossing, due to the parceling out of the favorable growth factors. Because *character factors are carried in groups* it is practically impossible to obtain all the good qualities of the hybrid recombined in any one pure-breeding individual.

According to this view hybrid vigor results from a temporary securing of all or many of the good qualities from two diverse parents. The reduction in size and vigor is merely going back to the condition of the parents before they were crossed. In this way it is a passing effect leaving no permanent imprint for good or for evil on the race. The consequences of crossing and close-mating are far reaching and indirectly more important than is indicated by these necessarily brief statements.

Hybrid vigor is a cloak of armor protecting many individuals possessing hidden weaknesses and unfavorable characters from the stern but just hand of natural selection. The outcropping of these undesirable traits in human society is sad but nevertheless reliable evidence that they make up a part of the inheritance. Feeble-mindedness, insanity, epilepsy, congenital cataract and deaf-mutism may be mentioned as illustrative. In plants chlorophyll deficiency, dwarfness, susceptibility to disease, absence of supporting root structures are comparable. Such characteristics and many other weaknesses of a more indefinite nature remain hidden from sight for the most part in wide and continuous crossing. They rarely make their appearance because the chance for the mating of two individuals possessing the same deficiencies is slight. Usually what one parent lacks the other supplies so that there is a pooling of hereditary resources enabling the offspring to make the best of bad ancestry. When like heredities are brought together the undesirables appear although they may not have been even suspected by the parents transmitting them. *Here lies the real danger in consanguinity.* In close inter-mating the chances for like factors to be brought together are enormously increased so that the results of inbreeding, even in small degree if the previous generations have been long outcrossed, may be decidedly injurious or even disastrous.

But to consider inbreeding as harmful is like blaming the detective for the crimes he unearths. Instead of being condemned it should be commended. It is now clearly seen that the system of continued close-mating has greater value in practical plant and animal improvement than previously realized. By subjecting

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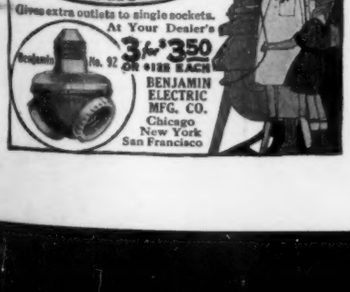



a naturally cross-bred race to a rigid process of continued self-fertilization or inter-mating of the closest kind, possible weaknesses are brought to light and may be eliminated. The purified types can then be best estimated according to their true worth since stripped of the protection of hybrid vigor they must stand or fall on their own merits. In this way inbreeding may be made a potent factor for permanent betterment.

What application these conclusions may have in eugenics one may not even hazard a guess. In the present state of our lack of knowledge it is worse than folly to make recommendations for the guidance of practices in marriage with regard to the consequences of consanguinity. In some cases the result of close-mating has been a gain, in others a calamity. It is not yet possible to predict with surety what will be the outcome in particular instances. What is important is the constitution of the ancestry in respect to inherited characters. Our present indifference to the keeping of accurate and permanent records of the physical and mental traits of every individual in the country will sometime be looked upon as nothing short of criminal carelessness. The one outstanding feature is clear that in avoiding relationship-marriages to prevent the appearance of undesirable characters we are not permanently helping the situation in the least. Deficiencies and weaknesses instead of being eliminated as we wished they might be are merely covered over, hidden from sight and handed on as a problem for future generations to solve.

## Uprooting a Tree With Dynamite

*(Continued from page 231)*

The blowing up was carefully prepared for by the drilling of no less than 24 holes about the roots of the giant derelict. In these were distributed 110 pounds of dynamite in 220 half-pound cartridges. The charges were connected in series and set off by a machine 500 feet from the spot. The detonation lifted the entire tree from the ground, and filled the resulting crater with the debris. The drilling of the holes was performed by aid of a small gasoline engine.—*Foster C. Hillegass.*

## Our Technical Achievements in the Great War

*(Continued from page 233)*

growing ascendency of the Allies was due entirely to the Americans. By November 1 the Allied rifle strength had a superiority over the German of more than 600,000 rifles.

### Thirteen Battles

American troops saw service on practically every stretch of the Western Front, from the British line in Belgium to inactive sectors in the Vosges. In a sense the entire war on the Western Front was a single battle, but thirteen major operations have been recognized in which American units were engaged. The names of the battles and the number of Americans engaged are given in the accompanying table:

| Operation | Approximate number of Americans engaged. |
|---|---|
| West Front—Campaign of 1917: | |
| Cambrai, Nov. 20 to Dec. 4— | |
| West Front—Campaign of 1918: | |
| German offensives, March 21 to July 18— | |
| Somme, March 21 to April 6... | 2,200 |
| Lys, April 9 to 27 ..... | 500 |
| Aisne, May 27 to June 5 ..... | 27,500 |
| Noyon-Montdidier, June 9 to 15 | 27,000 |
| Champagne-Marne, July 15 to 18 | 85,000 |
| Allied offensives, July 14 to Nov. 11— | |
| Aisne-Marne, July 18 to Aug. 6 | 270,000 |
| Somme, Aug. 8 to Nov. 11 ..... | 54,000 |
| Oise-Aisne, Aug. 18 to Nov. 11... | 85,000 |
| Ypres-Lys, Aug. 19 to Nov. 11.. | 108,000 |
| St. Mihiel, Sept. 12 to 16 ..... | 550,000 |
| Meuse-Argonne, Sept. 20 to Nov. 11 ..... | 1,200,000 |
| Italian Front—Campaign of 1918: | |
| Vittorio-Veneto, Oct. 24 to Nov. 4 | 1,200 |


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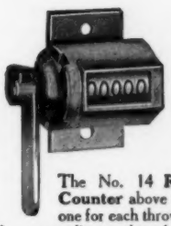

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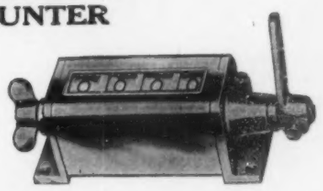

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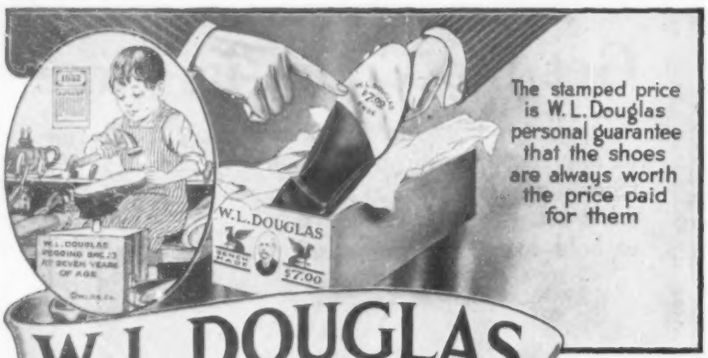


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### The Great German Offensive

The 1918 campaign opened with the Germans in the possession of the offensive. In a series of five drives of unprecedented violence, the Great General Staff tried to break the Allied line and end the war. These drives took place in five successive months, beginning in March; and each drive was so timed as to take advantage of the light of the moon for that month. The ground won by the Germans in each offensive is shown on the accompanying map; the arrows show the points at which American troops fought, and the small numbers are the numerical designations of the American divisions taking part.

The first drive opened on March 21, on a 50-mile front across the old battlefield of the Somme. In 17 days of fighting the Germans advanced their lines beyond Noyon and Montdidier and were within 12 miles of the important railroad center of Amiens with its great stores of British supplies. In this battle, also known as the Picardy offensive, approximately 2,200 American troops, serving with the British and French, were engaged.

The attack upon Amiens had been but partially checked when the enemy struck again to the north in the Armentieres sector and advanced for seventeen miles up the valley of the Lys. A small number of Americans, serving with the British, participated in the Lys defensive.

For their next attack (May 27) the Germans selected the French front along the Chemin des Dames north of the Aisne. The line from Rheims to a little east of Noyon was forced back. Soissons fell, and on May 31 the enemy had reached the Marne Valley, down which he was advancing in the direction of Paris. At this critical moment our Second Division, together with elements of the Third and Twenty-eighth Divisions were thrown into the line. By blocking the German advance at Chateau-Thierry, they rendered great assistance in stopping perhaps the most dangerous of the German drives. The Second Division not only halted the enemy on its front, but also recaptured from him the strong tactical positions of Bourescheş, Belleau Wood, and Vaux.

The enemy had by his offensive established two salients threatening Paris. He now sought to convert them into one by a fourth terrific blow delivered on a front of 22 miles between Montdidier and Noyon. The reinforced French Army resisted firmly and the attack was halted after an initial advance of about 6 miles. Throughout this operation (June 9-15) the extreme left line of the salient was defended by our First Division. Even before the drive began the division had demonstrated the fighting qualities of our troops by capturing and holding the town of Cantigny (May 28).

There followed a month of comparative quiet, during which the enemy reassembled his forces for his fifth onslaught. On July 15 he attacked simultaneously on both sides of Rheims, the eastern corner of the salient he had created in the Aisne drive. To the east of the city he gained little. On the west he crossed the Marne, but made slight progress. His path was everywhere blocked. In this battle 85,000 American troops were engaged—the Forty-second Division to the extreme east in Champagne, and the Third and Twenty-eighth to the west, near Chateau-Thierry.

### The Allies Take the Offensive

The turning point of the war had come. The great German offensives had been stopped. The initiative now passed from Ludendorff to Marshal Foch, and a series of Allied offensives began, destined to roll back the German armies beyond the French frontier. In this continuous Allied offensive there may be distinguished six phases or major operations in which


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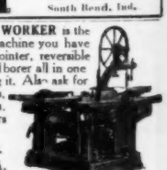

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the American Expeditionary Forces took part.

These six operations are shown on one of the maps in which the solid arrows indicate points where American divisions entered the line, and the broken arrows the distances over which they drove forward. In four of the six operations the American troops engaged were acting in support of Allied divisions and under the command of the generals of the Allies, as shown in our table and on our maps.

### Battle of St. Mihiel

The first distinctively American offensive was the reduction of the Saint Mihiel salient, which was carried through from September 12 to September 15, largely by American troops and wholly under the orders of the American Commander-in-Chief. The attack began at 5 a. m., after four hours of artillery preparation of great severity, and met with immediate success. It is interesting to note by way of comparison that the Union forces at Gettysburg numbered approximately 100,000, whereas about 550,000 Americans were engaged at St. Mihiel. In three days at Gettysburg, Union artillery fired 33,000 rounds, at St. Mihiel 1,000,000 rounds were fired in a four-hour artillery preparation. St. Mihiel caused 7,000 casualties, less than one-third the Union losses at Gettysburg. There were captured 16,000 prisoners and 443 guns.

### The Battle of the Meuse-Argonne

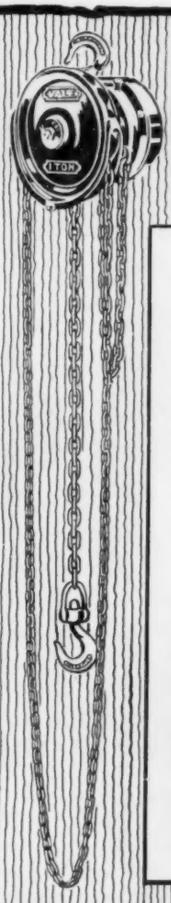
"The object of the Meuse-Argonne offensive," said General Pershing in his report of November 20, 1918, was "to draw the best German divisions to our front and to consume them." "This sentence" says Colonel Ayres, "expresses better than any long description not only the object, but also the outcome of the battle. Every available American division was thrown against the enemy. Every available German division was thrown in to meet them. At the end of forty-seven days of continuous battle our divisions had consumed the German divisions."

The battle of the Meuse-Argonne was beyond compare the greatest ever fought by American troops, and there have been few, if any, greater battles in the history of the world. From the American viewpoint, the following are the dates of the great battles:

| | |
|---|---|
| Days of battle | 47 |
| American troops engaged | 1,200,000 |
| Guns employed in attack | 2,417 |
| Rounds of artillery ammunition fired | 4,214,000 |
| Airplanes used | 840 |
| Tons of explosives dropped by planes on enemy lines | 100 |
| Tanks used | 324 |
| Miles of penetration of enemy line, maximum | 34 |
| Square kilometers of territory taken | 1,550 |
| Villages and towns liberated | 150 |
| Prisoners captured | 16,059 |
| Artillery pieces captured | 468 |
| Machine guns captured | 2,864 |
| Trench mortars captured | 177 |
| American casualties | 120,000 |

### Record of the Twenty-nine Combat Divisions

It is impossible within our limitations of space, to enter with any detail into the story of the achievements of the twenty-nine combat divisions that fought in Europe, and so we have selected from the army statistical account a series of three diagrams showing how far each division advanced against the enemy; how many prisoners were captured by each, and what were the casualties suffered. It may be noted that the 77th National Army Division, composed largely of troops from New York City, made the greatest advance, namely a total of 71½ kilometers or nearly 45 miles. The total advance for all the divisions is 485

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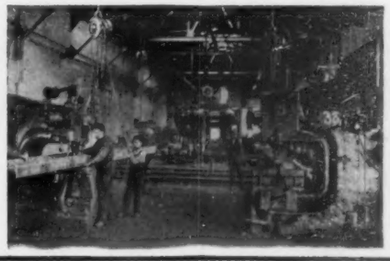



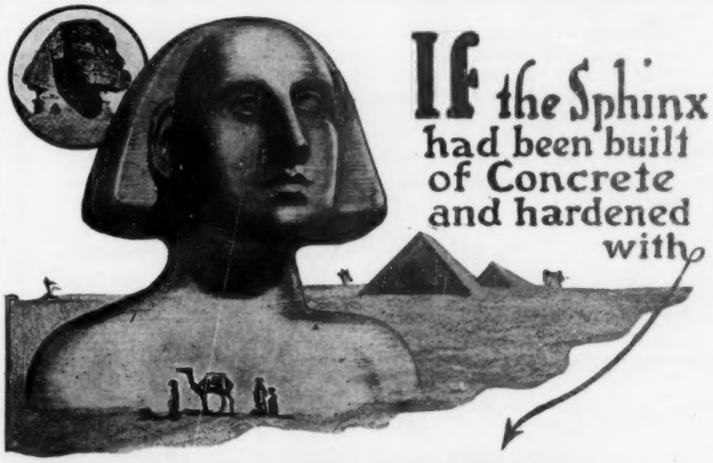

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miles and the average gain for each division is 17 miles.

The total number of prisoners taken by our armies was 62,079. The total number of Americans taken prisoner by Germans was 4,434.

The price paid for these achievements was 286,000 battle casualties. "A heavy price, when counted in terms of the individuals who gave their lives or suffered from wounds; a small price when compared with the enormous price paid by the nations at whose sides we fought."

In the roll of honor of the divisions for battle casualties, it should be noted that battle deaths include both those killed in action and those who died of wounds.

## Naval Radio Remote Control

(*Continued from page 234*)

with the former isolated spots chosen for coastal stations.

The accompanying map shows the location of the several outlying stations covering the water approaches to New York Harbor, as well as the relationship they bear to the control center in respect to handling the radio traffic of incoming or outgoing vessels. The heavy dotted lines denote the telegraph control wires by which the control operator operates any of the remote transmitters. This long-distance operation, by the way, is accomplished by making use of a specially-constructed magnetic circuit-breaker, the armature of which is provided with sufficiently large contact points to permit the passage of the heavy current necessary to operate the radio transmitter, while the electromagnets are connected through a local battery to the relaying contacts of a main-line telegraph relay. The connection between the two systems at this point is, therefore, a mechanical-electrical one.

The arrow lines indicate the zones within which the district stations may best handle the traffic of incoming or outgoing vessels, the purpose of this arrangement being that as soon as a ship passes out of one zone its traffic is taken up by the station of the next zone, thereby permitting the first zone station to seek the traffic of the next approaching vessel, and so on along the line of communication.

The purpose of the master control station is that any transmitter or any combination of transmitters may be utilized simultaneously, as in the case of distress signals or when it is necessary to transmit important broadcasts from all combined stations on two or more wave lengths such as the commercial and naval ones. Obviously, the control station is in a position to supervise the activities of all outlying stations, and with this remote control system there is never any loss of time owing to power failure or total breakdown of any individual transmitter. There are at all times several other stations to rely upon.

At the central control station there are no actual transmitters; but through its connecting land wires, any of the outlying radio transmitters may be employed. However, the central control station is provided with five receiving antennæ and five separate receivers, employing modern vacuum tube circuits ranging from 300 to 13,000 meters. The various antennæ are erected at such opposing angles from each other as to overcome possible mutual induction. Five or more operators are constantly on watch at the radio control station, in addition to the supervisor.

The practical application of the system may be explained in the following manner:

The supervising chief at the master control station is in supreme control of the outlying stations, and no radio traffic is accepted or transmitted without his permission. If one of the operators on watch at the control station hears four vessels calling New York radio, he informs the supervisor, who, being provided with a special "cut-in" system, determines by strength of signals and other characteristics the approximate distances of the four vessels, as well as whether they are on the trans-Atlantic or coastwise routes. Having determined that No. 1 ship is trans-Atlantic, Montauk Radio is notified by land wire to accept the vessel's traffic directly, using its local transmitter and receiver. No. 2 vessel, in this case being coastwise, will in a similar manner be assigned to Mantoloking Radio. In the case of vessel No. 3, the supervisor, not being able to determine its approximate location or route, will request the radio-compass operators located at each of the outlying stations to secure its position.

If the location of this vessel is within the zone best handled by Fire Island or Seagate Radio, the supervisor will designate either one of these stations to work with him independently. As for vessel No. 4, which we will assume to be a sound or harbor vessel, reception may be done at the control station; but in this case the control operator will employ the transmitter of either the Brooklyn Navy Yard or the Bush Terminal station, using low power in order to minimize local interference.

Thus the supervisor at the control station is always in a position to listen-in and guard for possible calls from other vessels, and can handle emergency traffic such as distress or other urgent calls. In the case of Naval vessels, the to and from traffic is handled on higher wave lengths than the commercial traffic of 300, 450, and 600 meters. Two operators are constantly on watch for this class of traffic.

In order that ship operators will not become confused as to which of the outlying stations are transmitting, each of them has been assigned designation numerals which are transmitted immediately following the call letters or in the following order:

| | |
|---|---|
| Montauk, L. I. | *NAH1* |
| Fire Island, L. I. | *NAH2* |
| Rockaway, L. I. | *NAH3* |
| Brooklyn Navy Yard, N. Y. | *NAH4* |
| Bush Terminal, N. Y. C. | *NAH5* |
| Sea Gate, N. Y. | *NAH6* |
| Mantoloking, N. J. | *NAH7* |

There are numerous instances, which could be described if space permitted, demonstrating combinations of all kinds in using outlying stations, either by remote or independent control. Many complex situations arise in present radio congestion, and the remote control system must always be flexible enough to take care of them. The problem of overcoming future radio interference, however, is one requiring the serious thought and attention of all governments. It is quite probable that it will eventually be solved by an international agreement, whereby a series of commercial wave lengths will be assigned vessels and shore stations of the world in such a manner as to eliminate much of the congestion and resulting interference now generally prevailing in and about the tune of 600 meters.

## Platinum

THE inactivity of the Russian platinum mines has caused a corresponding increase in activity in Colombia. A large company has recently been formed to operate in Colombia, which is reported to hold 10,000 acres of land as well as 50 miles of river bottom. The operations of this company should materially increase the output of platinum from Colombia.

It is announced that the War Department through the Chief of Division of Sales of Munitions will dispose of 19,000 ounces of platinum at a minimum cost of $105 an ounce.

A substitute for platinum in electrical apparatus has been the object of some private investigations. One satisfactory substitute for cathodes was found to be 90 per cent gold and 10 per cent copper.


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# Halving Price and Doubling Service—with the G.T.M.

***They used to pay $25.00*** for double belts that gave about a year of questionable service on a test block drive, off a countershaft, in the Garden City Fan Company's testing room. In June, 1917, they put on a Goodyear Belt specified by a G.T.M.—Goodyear Technical Man—for which they paid $12.50. It has already lasted two years, and is still in good condition. For half the price, they have had twice the service, and better service at that.

***Mr. H. C. Richards, the superintendent,*** had tried about every kind of belt on that drive. None of them had been satisfactory, mainly because the test block was not stationary and whenever a new fan was put on it to be tested out the workmen lined up the belt "by eye." The best double belts warped and curved because of this misalignment—and they slipped a lot, too. The cheap belts that he tried lasted about two months.

***When a G.T.M. called,*** Mr. Richards was very skeptical. He didn't think that much could be done toward reducing belt costs and troubles. But he thought he couldn't lose by trying—and he didn't.

***The 4-inch 5-ply Goodyear Belt*** of Glide construction, recommended by the G.T.M. has served for two years at a cost of $6.25 per year. The best costs obtained before were $25.00 a year. And there isn't any trouble at all. In spite of the frequent misalignment the Goodyear Belt still runs straight and true.

***After it had run only about six months,*** they were so pleased with the freedom from trouble it gave them, that they ordered another for a second testing drive just like it. And since then they have had a G.T.M. specify many other belts for them—ranging all the way from one and three quarter inches to eight inches wide.

***If you have a belt-devouring drive***—no matter how small or how large—ask a G.T.M. to call. He'll do it without charge when next he is in your vicinity. There are many G.T.M.'s—all with experience in many plants—all trained in the Goodyear Technical School—all experienced in selling belts to meet conditions and not as a grocer sells sugar. The G.T.M.'s services are free simply because the savings they effect for belt-users are so considerable that a gratifying volume of business is certain to come to us within a few years from the plant served—just as it has in the case of the Garden City Fan Company.

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